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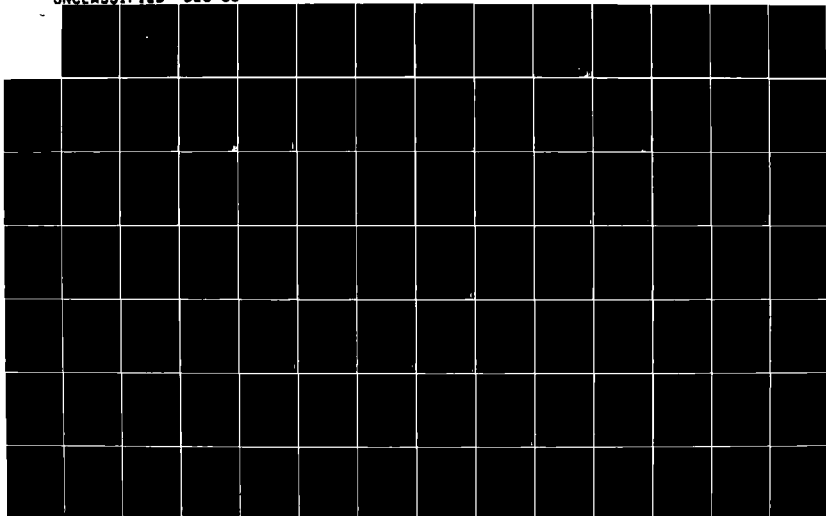
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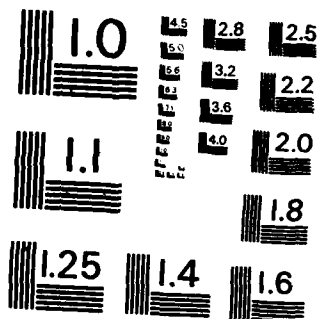
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INSPECTION OF U.S. FLAG VESSELS IN FOREIGN COUNTRIES:
AN APPLICATION OF COST EFFECTIVENESS ANALYSIS

by

Mark E. Ashley

Allen L. Thompson, Jr.

December 1983

Thesis Advisor:

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Inspection of U. S. Flag Vessels in Foreign Countries:
An Application of Cost Effectiveness Analysis

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ABSTRACT

During the 1970's, the Coast Guard opened several overseas offices to carry out the increasing Commercial Vessel Safety activities occurring chiefly in Europe and the Far East. These offices were closed in April of 1982, to reduce operating expenses in response to political pressure and administrative initiatives to cut the federal budget. Overseas Commercial Vessel Safety activities are currently performed by U.S. based personnel travelling on temporary additional duty orders.

This thesis begins with a review of the Coast Guard's Commercial Vessel Safety program. Procedures involving cost effectiveness analysis are reviewed and applied in an analysis of whether or not the overseas offices should be reopened. The analysis is intended to provide information to internal program managers that is useful in the decision making process.

TABLE OF CONTENTS

I.	INTRODUCTION	7
	A. PURPOSE AND METHODOLOGY	7
	B. DESCRIPTION OF COAST GUARD COMMERCIAL VESSEL SAFETY PROGRAM	12
	C. OTHER PARTY INTERESTS	20
II.	COST EFFECTIVENESS ANALYSIS PROCEDURES	20
	A. INTRODUCTION	23
	B. PROBLEM DEFINITION	30
	C. LISTING OF ALTERNATIVES	32
	D. CRITERIA OF CHOICE	34
	E. DETERMINATION OF COSTS	37
	F. DETERMINATION OF BENEFITS	40
	G. COMPARISON OF ALTERNATIVES	40
	H. PROBLEMS AND CONCLUSIONS	49
III.	DESCRIPTION OF THE PROBLEM, DESIGNATION OF ALTERNATIVES AND CRITERION	54
	A. INTRODUCTION	54
	B. PROBLEM SPECIFICATION	59
	C. THE ALTERNATIVES	62
	D. CRITERION	64
IV.	DESCRIPTION AND MEASUREMENT OF COSTS	65
	A. INTRODUCTION	65
	B. CLASSIFICATION OF COSTS	68
	C. DETERMINATION OF COSTS OF THE ALTERNATIVES	78

V.	DESCRIPTION AND MEASUREMENT OF EFFECTIVENESS	97
	A. THE EFFECTIVENESS MODEL	97
	B. DETERMINATION OF THE EFFECTIVENESS OF THE ALTERNATIVES	98
VI.	PROGRAM ASSESSMENT	100
	A. APPLICATION OF SPSS	100
	B. SOURCES AND DESCRIPTION OF DATA	100
	C. EVALUATION OF DATA	103
VII.	EVALUATION OF ALTERNATIVES	117
	A. EVALUATION OF QUANTIFIED FACTORS	117
	B. ASSESSMENT OF NONQUANTIFIED FACTORS	121
	C. PENDING LEGISLATION	126
	D. RECOMMENDATIONS	127
	APPENDIX A: COST AND MANHOUR DATA AND COMPUTER PROGRAM	130
	APPENDIX B: EFFECTIVENESS DATA AND COMPUTER PROGRAM	157
	APPENDIX C: COMPUTER TABLES AND LISTINGS	169
	APPENDIX D: DATA VALIDATION COMPUTER PROGRAM	202
	LIST OF REFERENCES	205
	INITIAL DISTRIBUTION LIST	208

I. INTRODUCTION

This chapter begins with a brief summary of the purpose of this analysis and the methodology employed. The second section looks at the program history, objectives and various concerns that have emerged over the past decade with special emphasis on those dealing with overseas inspection. The third part of this chapter discusses the other major parties the Coast Guard interacts with in carrying out its Commercial Vessel Safety responsibilities and concentrates on some key interests of these parties.

A. PURPOSE AND METHODOLOGY

It is the purpose of this thesis to provide information and analysis which may be useful to Commercial Vessel Safety (CVS) program planners and managers regarding the inspection of U.S. flag vessels in foreign countries. The Coast Guard has historically been engaged in the enforcement of laws and regulations pertaining to maritime safety. Jurisdictional authority over U.S. flag merchant vessels is generally not constrained by the geographical area in which a vessel operates. Several overseas inspection offices were opened during the past decade in response to increasing overseas activities on the part of the U.S. fleet. Substantial participation in the offshore petroleum industry and

increased competition from foreign shipyards have greatly influenced this trend.

Closure of the CVS facilities located in Europe and the Far East in April of 1982 affected the method of conducting operations in those areas. The closures were essentially carried out as a means to expeditiously reduce operating expenses during a period of political pressure and administrative initiatives to cut the federal budget. We have been unable to find a formal analysis conducted at the time of the closures concerning changes in the comparative cost and effectiveness of inspections.

Two basic alternatives are compared in this analysis. Other possible alternatives are identified. The first alternative involves the continuation of present operations wherein all overseas activities are carried out by U.S. based personnel, travelling under temporary additional duty orders (TAD). The second alternative involves reopening the same facilities which were closed in 1982. Due to workload and the number of foreign based personnel, a major participation of U.S. based personnel remains necessary under this alternative. Under each alternative, a constant level of program personnel is assumed. A rather unique aspect of this analysis is that both alternatives have been in operation in the recent past. For this reason, actual cost and effectiveness data have been collected and compared. This

empirical orientation provides for a compelling evaluation of on-going programs.

Several factors related to effectiveness are identified. These factors include: vessel inspection quality, the availability of personnel travelling overseas, inspection consistency and cohesiveness, logistics and morale. Conceptually, the closures have raised the possibility of several problems in these areas. Of the factors identified, vessel inspection quality is considered to be more directly related to the attainment of safety of life and property goals. The effectiveness model is therefore focused on the collection of quantifiable data that is considered relevant to the measurement of inspection quality. Data samples were obtained from inspection records on file at Marine Inspection Office, New York and Marine Safety Office, Honolulu. Unequal amounts of both cost and effectiveness are anticipated for each of the alternatives. The criterion applied therefore involves minimization of the ratio of cost to effectiveness measures.

Costs that are incurred by the Coast Guard and attributable to overseas CVS activities are considered relevant to this analysis. These costs are classified under five categories: (1) overseas office operating costs, (2) incremental personnel moving costs, (3) incremental living allowances, (4) lost time to travel costs and (5) billing lag time costs. Travel and billing costs are attributable to

alternative one, the present operating mode. Costs are incurred in all five categories under the second alternative.

Data concerning overseas office operating costs were obtained from ~~internal~~ Coast Guard accounting reports. Figures include expenses incurred in the rental utilities, supply and maintenance of overseas facilities. Estimates of incremental moving expenses for an overseas billet are computed as the difference between the average OUTCONUS recurring cost per billet and the average INCONUS recurring cost. These figures were obtained from 1982 Standard Personnel Cost data. Incremental living expenses include a living (COLA) and housing (HOLA) allowance paid to overseas personnel in excess of the amount paid to personnel stationed within the Continental U.S. Average per person figures used in estimating these expenses are based on actual fiscal year 1982 cost data compiled by the planning and evaluation staff under the Office of Personnel at Coast Guard headquarters. Lost time to travel costs are computed in a formula in which the sum of travel manhours, converted to manyears, is multiplied by an annual standard personnel cost for a particular rank. Data concerning TAD manhours attributed to travel are contained in the travel claims submitted by inspectors. Standard personnel costs are listed annually in Commandant Notice 7100. Billing lag time costs are computed in a formula used to estimate the cost of money that is

imputed as a result of normal administrative delays in billing customers for overseas services. A delay is defined as the number of days between the date of departure on overseas duty and the date a vessel's owner or operator pays the bill for reimbursement of travel and subsistence expenses.

The remaining sections of this chapter provide general information concerning the Coast Guard Commercial Vessel Safety program. A discussion of the literature concerning cost effectiveness analysis procedures is contained in the following chapter. Readers knowledgeable in these areas may proceed to chapter three where the formal analysis undertaken in this thesis is initiated. In addition to the formal analysis of quantified cost and effectiveness factors, a discussion concerning the significance of other nonquantified factors is included. A conclusion to continue present operations is made, in chapter seven based on the evaluation of cost-effectiveness ratios for each alternative that are arranged in a quarterly format. Several recommendations are offered, based on information gained through the analysis and the assessment of the other performance factors.

B. DESCRIPTION OF COAST GUARD COMMERCIAL VESSEL SAFETY PROGRAM

1. Program History

a. General Program

The Commercial Vessel Safety program, hereafter called CVS, is the major component of the Coast Guard marine safety mission which is the largest of the Service's regulatory functions. The CVS program drew its first breath in the early 1800's as a result of a series of boiler explosions with subsequent loss of life. This led to the enactment of the first CVS law providing for periodic inspection of the hull and boilers of steam vessels.

The early CVS or inspection laws were administered under the Treasury Department, then the Department of Commerce and subsequently transferred with the Bureau of Marine Inspection and Navigation to the U.S. Coast Guard. A 1962 U.S. Coast Guard Roles and Mission Study recommended that a single Federal Agency be designated as the prime agent for maritime safety in the United States. This recommendation was approved and the Coast Guard has performed in that capacity since.

The coverage and intensity of the CVS program has increased drastically over the years as a result of major ship disasters, public concern for maritime safety and environmental protection, and maritime safety matters being included in international agreements. Congress responded to

this concern by enacting numerous statutes to ensure the safety of U.S. vessels, their crews and passengers. This legislation, coupled with international agreements which were ratified into law, greatly enhances the size and complexity of the CVS program. Incorporating safety matters into international agreement carries the added benefit for U.S. Commerce in that U.S. Flag Carriers are not disadvantaged by foreign competition adhering to lower safety standards. The CVS program is responsible for assuring the safety of life, property and the environment in and on waters subject to U.S. jurisdiction. The operating budget for carrying out the CVS functions as noted by the Coast Guard's Roles and Missions Study of 1982 totalled \$79.2 million in fiscal year 1982 or 5.7% of the Coast Guard budget.

Most of the CVS laws mandate that an activity be performed but in most cases leave the level of performance to the Coast Guard to establish. The specific level of performance is contained in the annual Coast Guard's Operating Plan. The development and enforcement of safety standards form the benchmark for the level of Coast Guard performance. The Coast Guard's Marine Inspection Offices (MIO's), Marine Safety Offices (MSO's) and their designated subunits are the operating units which enforce the laws and regulations. In 1980, there were 43 Marine Safety Offices, 6

Marine Inspection Offices and 3 overseas marine inspection activities.

b. Overseas Program

The approval of a vessel's plans and initial inspections are the primary tools used by the Coast Guard for enforcing safety standards. Not performing plan review and initial inspection would place the burden of exposing any inherent unacceptable safety compromise due to design, improper material construction or equipment installation on the periodic in-service inspection or on failure in operation. Such a system most likely would result in catastrophe or at least involve substantial remedial costs. This concept is of vital importance in the context of Commercial Vessel Safety and should be pursued whether the construction of U.S. vessels is undertaken at home or abroad. Rear Admiral Clyde T. Lusk, current Chief, Office of Merchant Marine Safety, indicated his views during a personal interview in July of this year, by stating: "U.S. Flag Vessels under construction in foreign shipyards should receive the same attention given to those vessels built in the United States."

Beginning in the 1970's the Coast Guard began permanently assigning personnel in certain overseas locations to carry out Commercial Vessel Safety activities. Offices were established in Guam, Kobe, Japan, Singapore and Rotterdam, Netherlands. These offices cover new construction

conversions and periodic inspections in Europe, Africa, the Middle East and the Far East. The overseas program generally consisted of marine safety personnel attached to the U.S. Embassies in the particular areas with the exception of some brief temporary additional duty (TAD) inspectors responding to an increase in overseas workload.

In April, 1982, as a result of significant budgetary restraints, the overseas offices in the Netherlands, Japan, Singapore and Guam were closed.

"Closure of these offices were effected during FY 1982 in order to realize personnel and dollar savings. The intent in closing these overseas offices was not for the purpose of giving up our overseas inspection program, but rather to markedly change the way we do it." (Commercial Vessel Safety Operating Plan, FY 85-84, U.S.C.G.)

Public Law 96-376 also played a significant role in the decision to close the foreign offices. Public Law 96-376 granted the Coast Guard statutory authority to require owners to reimburse the Coast Guard for travel and subsistence expenses incurred for overseas inspections and examinations.

The workload and area of responsibility of the closed offices were transferred as follows:

MSO Honolulu____ Inspection activities in the Far East,
Pacific Basin, Indian Ocean as far as
the Arabian Sea.

MIC Seattle____ Inspection activities in Western Canada.

MSC San Diego_____ Inspection activities in Western Mexico
above 20 degrees North latitude.

MIC New Orleans_____ Inspection activities in South and Central
America, Western Coast of Mexico below 20
degrees North latitude.

MIC New York_____ Inspection activities in Europe, Red Sea,
Mediterranean Sea, Arabian Sea, Persian
Gulf, and all of Africa.

MSC Boston_____ Inspection activities in Eastern Canada.

(Federal Register/VO147,N055/Monday, March 22,1982)

There still remains a heavy demand for CVS services in the foreign arena. Several factors account for this demand. The continuing search for increased sources of petroleum and the discovery of the North Sea fields has produced a sizeable U.S. maritime presence based overseas. These vessels are not returning to the U.S. for required safety inspections. Another factor involves the keen competitive structure of the foreign shipyards in relationship to U.S. shipyards for similar construction and/or repairs.

2. Program Objective

Marine Safety is one mission of the Coast Guard. The intent of this mission has been to benefit society as a whole, even though there are some benefits which accrue specifically to the owners, operators and crews of the vessels. The mission has historically been funded in the

form of general tax revenues. CVS is a program within that mission and vessel inspection is a function of that program.

The objective of the Commercial Vessel Safety program as outlined by the Coast Guard in testimony in 1981 before the Subcommittee on Coast Guard and Navigation, U.S. House of Representatives, is stated as: "the prevention of deaths, personal injuries, and property loss associated with vessels and other facilities engaged in commercial or scientific activity in the marine environment."

The objective is pursued, as noted in the 1982 Coast Guard's Roles and Mission Study, through the administration of the following functions:

a) Review and approve new vessel construction plans to ensure that the vessel is of seaworthy design and in keeping with Federal construction standards;

b) Periodically inspect vessels to ensure that they are being maintained and repaired properly, carry proper lifesaving equipment and in general remain seaworthy;

c) License and certificate the personnel that operate U.S. vessels to ensure that they are competent, trained, and physically qualified to serve at sea;

d) Investigate marine casualties to establish the cause of the casualty, recommend remedial procedures to limit their recurrence, and, if necessary recommend punitive action against personnel in violation of U.S. maritime law; and,

e) Admeasure and document U.S. vessels to facilitate their use in international trade and provide evidence of ownership for identification and financial relationships.

3. Problems and Concerns with the Program

Several studies were undertaken in the late 1970's as a result of:

a) Several major marine casualties resulting in loss of life and property and environmental damage in or near U.S. waters,

b) Greater concern voiced by the public for ecological and cost consideration,

c) Greater Congressional interest in the effectiveness of Coast Guard resources allocation.

A study which drew a significant reaction from the Coast Guard and the maritime industry was the General Accounting Office Report titled "How Effective is the Coast Guard in Carrying Out Its Commercial Vessel Safety Responsibilities?" dated May 25, 1979. The study indicated that the Coast Guard should make improvements in the following areas of the CVS program:

1. Expand in-house training, establish standards for qualifying inspectors, establish an inspection job classification, and extend the inspectors' tour of duty.

2. Reexamine the possibility of transferring some aspects of the U.S. vessel inspection program to the American Bureau of Shipping.

3. Provide comprehensive direction for boardings and examinations, improve follow-up on tankship safety deficiencies, expedite the development of the Marine Safety Information System, adopt an aggressive penalty policy, and emphasize the boarding and examination of uninspected U.S. Commercial vessels.

4. Require a demonstration of competency for issuance or renewal of marine industry personnel licences, establish medical standards for determining the physical fitness of maritime personnel, seek jurisdiction over state pilots and abolish the shipping commissioner functions.

5. Study the staffing needed to carry out activities in the Coast Guard's commercial and international safety activities.

The Coast Guard rejected several broad indictments but was in substantial agreement with the study's basic tenets. The idea of delegation of services continues to be an issue concerning inspection functions of the CVS program. "The most prominent question which emerged during the Subcommittee's Oversight hearing was whether or not some of the functions now being performed by the Coast Guard can be undertaken with equal competence and at less cost to the Federal Government by classification societies such as the American Bureau of Shipping or similar U.S. organizations."

(Subcommittee on Coast Guard and Navigation, U.S. House of Representatives, November 1981)

A particular benefit of a non-governmental agency is that costs will be borne by the private sectors. Another strength is that inspections now performed by non-governmental entities will not be duplicated by Federal inspections except on a spot-check basis.

A weakness of involving a non-governmental agency in the enforcement of laws and regulation is the potential for conflict of interests. Another weakness is the lack of enforcement authority of non-governmental organizations and the lack of control by the Federal agency which is ultimately responsible for enforcement.

Studies and Congressional hearings similar to the ones named, especially during times of strongly perceived budgetary constraints, and initiatives to minimize regulatory impact will continue to require critical review of traditional legislatively mandated CVS functions.

C. OTHER PARTY INTERESTS

There are many organizations in both the Federal and private sectors that have an impact on the U.S. maritime industry and in particular the Commercial Vessel Safety program. These organizations and the Coast Guard interact over a wide range of functions. This interaction influences all sectors of the industry such as the financial

institutions which provide capital for ship construction; the marine insurance industry, classification societies, cargo bureaus, standard setting organizations which provide a basis for quality control; the maritime training and education establishment and the great variety of businesses which build, maintain, supply and operate vessels.

This section will describe briefly several organizations that have a more pervasive impact.

1. The American Bureau of Shipping

The American Bureau of Shipping (ABS) was created in 1862 by the New York Legislature as a non-profit, international ship classification society. ABS has a primary function of certifying the soundness and seaworthiness of merchant ships and other marine structures. ABS is entirely supported by the fees charged to shipowners who request classification services. Just as the Coast Guard sets vessel safety standards to meet national safety objectives, ABS sets standards, known as rules for the purpose of placing a vessel in class, principally for gauging its insurability.

As of June 1983, there were 15,580 vessels totalling approximately 191,076,014 deadweight tons under classification by ABS. The society is represented in 94 countries with a work force of 1655 exclusive employees, in 140 exclusive offices worldwide. An exclusive employee is one who works full time for the organization.

A strong driving force has emerged in the past several years for transferring or delegating some functions of the CVS program to ABS. This force led to the passage of Public Law 97-136 which provides authority for the Coast Guard to delegate vessel inspection or examination duties to the American Bureau of Shipping or similar American Classification Society to the maximum extent practicable. It should be noted that ABS is the only American classification society currently chartered in the United States. This law further provides specific authority for the Coast Guard to utilize ABS or a similar American classification society for review and approval of vessel hull, machinery, piping and electrical plans.

Discussion between ABS and the Coast Guard resulted in a Memorandum of Understanding (MOU) dated June 9, 1981, which addressed the basic guidelines for cooperation, plan review and inspection of vessels under construction which are to be classed by ABS and certified by the Coast Guard. This MOU, which is referred to as MOU I, was relatively limited in scope but served as a useful tool for further discussions and agreements resulting in a second MOU (MOU II).

MOU II, dated 27 April 1982, superseded and expanded upon MOU I by providing for further areas of plan review and Coast Guard acceptance of inspection tasks associated with construction of new vessels and major conversions built to ABS classification rules and certified by the Coast Guard.

MOU II also provided instruction to the industry on plan submittal procedures, areas of responsibility between ABS and the Coast Guard and provisions for Coast Guard oversight and general administration.

The Coast Guard initially projected a 15.5% reduction in new construction workload resulting from the MOUs. It is felt that a reduction occurred but not of the magnitude initially projected. At present, the actual effectiveness of the delegation of services to ABS has not been evaluated as noted in the required Annual Report to Congress concerning such delegation.

"Since implementation of Mou I (1 August 1981) and MOU II (June 1983), 663 vessels have come under the term of the agreements. During this period 422 vessels were completed under one of the MOUs. A comparison of Coast Guard man-hours devoted to vessels coming under plan review and inspection guidelines of the MOUs and those entirely under Coast Guard inspection presently does not provide meaningful information. Efforts will be made to track man-hours and the impact of the MOUs on Coast Guard technical and inspection resources and costs, and compare them with the certification program involving vessels not classed with ABS. (Annual Report to Congress, G-MP/24, U.S. Coast Guard, June, 1983)

The report also noted that the Coast Guard is moving hesitantly concerning the delegation of other services.

"As to ABS performing vessel inspection and re-inspection functions other than at new construction, we considered this to be a very long term option which will require further negotiations and considerable discussion. We currently do not support this additional delegation since the present MOUs have not been fully implemented to the extent possible, nor have we determined the true benefits/ costs of the on-going program. (Annual Report to Congress, G-MP/24, U.S. Coast Guard, June 1983)

2. Other Federal Agencies

"Other Federal agencies such as the Maritime Administration (MARAD) and the Occupational Safety and Health Administration (OSHA) also perform inspections and review certain safety aspects for vessels. MARAD has the role of owner/financier/promoter for vessels it subsidizes, while OSHA oversees the work place environment. For many maritime issues, Coast Guard regulations directly affect employee working conditions and thereby preempt OSHA's standards for these same conditions." (Coast Guard Roles and Mission Study, 1982)

MARAD requirements to inspect U.S. flag vessels are related only to compliance with construction constraints involving the construction differential subsidy and the inclusion of national defense design features.

The International Maritime Organization (IMO), formerly named Inter-Government Maritime Consultative Organization, was established in 1958 under the auspices of the United Nations. It has served as a focal point for international deliberation on marine safety since that time. IMO has expanded to 121 member countries from the chartered 21 members.

The Coast Guard has been officially delegated to represent the U.S. interest in IMO since its inception. CVS program personnel participate at all levels of the organization.

3. The Maritime Industry

a. Shipping Companies

The U.S. shipping industry is a very complex industry which consists of many segments, each structured

differently. The privately-owned U.S. fleet is divided according to whether a shipping firm is engaged in international ocean shipping or in lakes, rivers, coastwise or intracoastal domestic shipping. These areas are more commonly referred to as engagement in foreign or domestic trade respectively. U.S. ocean shipping is further divided by mode of operation, namely liners or tramps. Domestic shipping is classed geographically according to the area of operations; Great Lakes, rivers, coastwise, or intracoastal shipping.

A primary concern for the shipping companies is the extent to which the burden of CVS regulation can be passed on to the consumer. In the Maritime Administration Study dated December 1973, cost of compliance with Federal regulations were estimated to be approximately one percent of total construction and operating cost.

There is a distinct difference in the market structure facing the foreign and domestic trade sectors. In the foreign trade, U.S. vessels (documented vessels of the United States) must compete with foreign and U.S. firms operating ships registered in foreign countries and manned by non-U.S. crews. In the domestic trade, only U.S. vessels are allowed to participate. CVS regulation, with its main focus on safety, should not add a crippling cost disadvantage on the U.S. Ocean fleet.

b. Shipyards

The vigor of U.S. commercial ship building and repair yards rests heavily on the strength of the nation's Merchant Marine and the Government policies on the size of its public fleet (i.e. Navy, Coast Guard, and U.S. Army Corps of Engineers).

"Shipbuilding and repair activities are under extreme and constant pressure from highly competitive foreign shipyards, which offer to build vessels at extremely low prices with assurance of support from their governments. Based on this government support, and to ensure their survival during this time of depression, overseas yards are quoting prices on construction of new ships at 20 to 40 percent below actual costs. This places an awesome burden on U.S. shipbuilders competing in a worldwide market." (Critical Issues in Maritime Transportation, 1981)

This pricing strategy has tended to increase the Coast Guard workload in overseas inspections.

"In 1979, two major U.S. ship operators signed letters of intent or contracts with Japanese or Korean shipyards for construction of 24 large containerships at an average cost of about \$33 million each. It is expected that the total cost of these vessels if contracted for in the U.S. yards would have been not \$800 million, but two and one half times-to-three times that amount. During 1979, at least one major U.S. shipyard closed its doors on shipbuilding, leaving a 225,000-ton tanker and a number of other vessels incompleated." (Critical Issues in Maritime Transportation, 1981)

The particular cases noted above led to the establishment of Marine Inspection Office, Kobe, Japan, in the fall of 1979.

It is projected in the CVS operating program for FY 85-94 that a major shipping bill will pass Congress in the near future. In addition to providing a framework for the

revitalization of the American Merchant Marine, it is likely that this bill will increase the foreign construction of American flag vessels.

II. COST EFFECTIVENESS ANALYSIS PROCEDURES

A. INTRODUCTION

This chapter will focus on procedures and tools used in the area of cost effectiveness analysis. Anyone attempting to conduct a study of this nature should first have a working knowledge of the theory involved so a plan of attack can be devised that will produce valid results that are acceptable to users of the information. "Too often, the tendency is to plunge directly into gathering data and estimating benefits and costs with the hope that it will all fit together at the end. In an undertaking as complex as CBA, this is not a wise course. Much effort is wasted and much remains undone when precise plans do not guide the analysis." (Sassone, Schaffer, 1978) Since our thesis deals with the analysis of a government activity, we will often concentrate on the applications of theory in this area.

1. Definitions

Several terms are used in the literature to label analysis of this nature. They include cost benefit analysis, cost effectiveness analysis, economic analysis, performance evaluation, policy analysis and systems analysis. There appears to be wide-spread disagreement among authors and

theorists regarding the definition of these terms and the placement of appropriate theoretical boundaries between them.

"Numerous other terms--operations analysis, operations research, systems engineering, cost utility analysis--might also be used, depending on the context, and, to different people, they might imply some subtle distinction. But they all convey the same general meaning. Moreover, there exist among them no distinctions in principle. Whatever differences may be found are simply matters of degree, emphasis, and context. What is important, therefore, are the characteristics they have in common. These include an effort to make comparisons systematically in quantitative terms, using a logical sequence of steps that can be retracted and verified by others." (Quade, 1967)

In his introduction to Cost-Effectiveness Analysis, author Edward S. Quade defines an analysis as one involving a comparison of alternative courses of action in terms of their cost and their effectiveness in attaining some specific objective. For the sake of consistency, we will continue to use the term cost-effectiveness in referring to this area of analysis.

2. Steps

The basic steps involved in a cost-effectiveness analysis include: a definition of the problem at hand and the objective of the analysis, a listing of alternatives, a means or criteria of choice used in evaluating the alternatives, the determination of costs and benefits of each alternative and the evaluation of the alternatives based on the criterion selected. Each of these will be discussed in the following sections of this chapter. These basic steps are normally included in an analysis but the form and content of each may

differ greatly due to the wide range and scope of problems addressed.

B. PROBLEM DEFINITION

1. The First Step

The first major step in undertaking a cost-effectiveness analysis is to define the problem at hand and to state the objective of the analysis. In The Decision Maker's Handbook, author Alexander H. Cornell states that the existence of a bona-fide problem is necessary before a decision (with or without the aid of analysis) can be made.

"Within any system or subsystem structure, a condition must exist that presents a decision maker with the opportunity to make a decision. Additionally, the situation should offer alternative courses of action to resolve the decision situation. Again it is appropriate to repeat an earlier observation: if there is no decision-making situation there can be no decision, no alternatives. ...At the other extreme, it is good to remember that a decision not to make a decision even where a decision situation exists is a decision in itself." (Cornell, 1980)

In many cases, the decision maker or user of the information and the analyst or provider of the information are not the same person. In these situations, the definition of the problem involves communication between the decision maker and the analyst as to what constitutes the problem. "The decision maker's input to the analyst will affect the analyst's output to the decision maker. The better the problem is specified, the more useful will be the final report to the decision maker." (Sassone, Schaffer, 1978)

Following the excerpt, authors Peter G. Sassone and William A. Schaffer then explain that this first step provides direction for the remainder of the analysis. "It is here that the decision maker plays a crucial role, communicating to the analyst precisely what he wishes to be done. It is the analyst's task to record these desires, and elicit whatever information is needed to exactly define the problem. While each project has its own unique features, many aspects of problem definition are common to most, and , although such a listing can never be complete, it forms a basic checklist for both the analyst and the decision maker." (Sassone, Schaffer, 1978)

2. Applications

Analysis, as stated in the preceding section, can be applied over a wide range of problem situations. In Analysis for Public Decisions, author Edward S. Quade lists four major applications of analysis pertaining to governmental programs. "Analyses are needed for such tasks as: (1) fairly routine evaluations of ongoing or proposed programs or projects with a view to changing the resource allocation or to improving operations with the same allocation; (2) comparisons of the costs and benefits of proposed programs; (3) the investigation of special issues or problems not associated with proposed or established programs but which someone inside or outside the government brings to notice; and (4) detailed preparation of new programs." (Quade, 1975) This

inherent diversity in applications reinforces the importance of a rather precise problem definition pointed out in the preceeding paragraph. This is not to say that once a problem has been defined it cannot be altered, refined or updated at some point during the analysis. The approach taken is often described as an iterative process.

3. Assumptions

A final point that relates to the problem definition stage concerns assumptions which are also related to the entire process. In the following excerpts, author Alexander H. Cornell describes the use of assumptions in an analysis.

"Assumptions are not only embodied in the formulation phase, they are necessary throughout the entire analytic study. ... Assumptions are used to limit the scope of a problem or opportunity, and to limit the scope of objectives and alternatives. Care must be exercised in this last application, for unduly restrictive assumptions will rule out some potentially significant objectives or alternatives. ...The best guide is to try to limit assumptions to those areas in which it simply is not possible to obtain facts. This last problem is greatly affected by resources and the time to gather information." (Cornell, 1980)

Cornell also points out that assumptions are inevitable, that they should be reasonable and that they be explicitly identified within the analysis.

C. LISTING OF ALTERNATIVES

Once the problem has been specified and defined, various alternatives or possible solutions are sought and identified. The number and diversity of alternatives are often influenced

by the nature of the problem, which, according to Sassone and Schaffer, takes one of the following three forms: (1) one project is to be accepted or rejected, (2) one of several projects is to be accepted, (3) several of many projects are to be accepted. The analyst's abilities and available resources also influence the quality and quantity of alternatives.

In Analysis for Public Decisions, Edward S. Quade offers the following comments concerning the search for alternatives.

"The generation of alternatives is, or should be, a creative act. ...Genuinely new alternatives are hard to come by simply because it is very difficult for the human mind to think of things someone has not thought of before. ...The process of searching for alternatives also includes a certain amount of evaluation, for in so doing the grossly inferior ones are implicitly screened out by simple tests for dominance or acceptability. Sometimes these tests are based more on similarity to alternatives found acceptable in the past than on estimates of their actual effectiveness. This is simply a reflection of the fact that similarity is often an efficient screening device. Possibly too much so; it is seldom that a radically unfamiliar alternative will appear useful because the screener, with coordination in mind, will tend to eliminate an alternative that does not appear to fit in with other areas of his organization. The familiar alternatives that change only incrementally have at least that virtue of fitting within the organization." (Quade, 1975)

Alexander H. Cornell identifies several potential sources of alternatives, each having a varying degree of analytic ability. These include someone with intuition, and expert, a group of experts and a committee. Other methods of obtaining alternatives include brainstorming, the Delphi technique and modeling. Even though arguments can be made for or against any of these sources or methods, they may be useful in

obtaining a workable set of alternatives. The number of alternatives should be manageable. This depends on the scope of the problem and the resources available for solving it. There is always the possibility that the theoretically "best" alternative was never uncovered and therefore was not chosen as the solution.

D. CRITERIA OF CHOICE

During this stage of the analysis, the criterion or decision rule to use in selecting an alternative over others is specified. There are two main levels at which criteria are applied, depending on the scope of the problem. One generally involves social or governmental decisions at the microeconomic level while the other is applied in less far reaching decisions at the organization or sub-organization level.

1. Economic Efficiency

The first and more general level involves the concept of economic or allocative efficiency. Economic efficiency exists within an economic system when it is impossible to increase general welfare with a given amount of resources and level of technology. Static efficiency is the term used for economic efficiency within a short time span where resources and technology are fixed. The term dynamic efficiency applies to an extended period of time where resources and technology are allowed to vary. "Economists, one might

think, could simply apply the optimization principle to the economy's present allocation of resources and goods: they could ask themselves whether the marginal benefit of any potential reallocation of resources or goods just equaled the marginal cost. If this marginal benefit did not equal this marginal cost, the present allocation would not be the best one." (Kohler, 1982) Unfortunately, this is not an easy process to undertake.

Economist Vilfredo Pareto was a pioneer in developing the concept of economic efficiency. He established a number of marginal conditions that should be met for a system to achieve economic efficiency. "If a reallocation of resources or goods left some individuals, in their own estimation, equally well off but others better off, social welfare had increased. If some felt equally well off but others worse off, social welfare had decreased. If some were better off and others worse off, the situation could not be evaluated by economic science-unless, that is, the gainers actually compensated the losers to the losers' full satisfaction and were still better off." (Kohler, 1982) Closely related to the Pareto conditions is the Kaldor-Hicks principle. This less stringent indicator of economic efficiency is referred to by author Edward M. Gramlich in Benefit-Cost Analysis of Government Programs. "The Kaldor-Hicks principle is that situation A is preferred to situation

B if the gainers could compensate the losers and still be better off. Notice that the Kaldor-Hicks principle does not require that the gainers actually do compensate the losers and so does not deal with the distributive consequences of policy changes." (Gramlich, 1981) Although the concepts of economic efficiency are theoretically preferred in the evaluation of projects or alternatives affecting general public welfare, practical application is usually difficult. Often a somewhat more specific criterion will be applied.

2. Lower level Criteria

The second level of criteria normally is applied in analysis at the organization level and in making decisions concerning programs at the agency level in government. There are three general criteria which are normally used. "The analyst may rank alternatives by one of three general criteria. These criteria conform to the three basic types of cost/benefit relationships: Unequal Cost/Equal Effectiveness, Equal Cost/Unequal Effectiveness, and Unequal Cost/Unequal Effectiveness. The three criteria are: (a) Least cost for a given level of effectiveness, (b) Most effectiveness for a given cost constraint, (c) Largest ratio of effectiveness to cost." (D.E.A.C., 2nd Ed.) There are also several criteria that are used to evaluate projects from a financial perspective. These include net present value, internal rate of return and payback period and are normally applied when

the costs and benefits of a project are more easily quantified in monetary terms.

E. DETERMINATION OF COSTS

There are several perspectives which may be taken in the process of determining the costs of the various alternatives. Each may be preferred under different circumstances. These perspectives include: (1) static costing and time phased costing, (2) incremental costing and (3) life-cycle costing.

1. Static and Time Phased Costing

Static and time phased costing methods are discussed by author Harry P. Hatry in "The Use of Cost Estimates." In this contribution, he states that static cost analysis is normally applied in system configuration or system comparison study and the costs commonly take one of the following three forms: (a) acquisition cost plus operating costs for a specified number of years, (b) acquisition cost less residual value plus operating costs for a number of years, (c) either of these two forms discounted to the present. Time phased costing typically takes one of these forms: (a) annual funding requirements, (b) cumulative funding requirements, (c) either of the two streams discounted to the present. This method is often applied in budgeting, particularly in the public sector. "To the extent that such considerations exist as annual funding constraints or the desirability of smoothing out annual funding, then the

display of the annual funding requirements will be of importance to planners. (As a practical matter, the major interest of Government planners is, of course, in the current and next budget years' requirements.)" (Hatry, 1967)

2. Incremental Costing

The incremental costing approach is not entirely independent from the methods already mentioned. This approach is commonly used in capital budgeting decisions in the area of managerial accounting. It is also related to the concept of marginal costing and the problem of deciding which cost are relevant.

"Cost analysis, like systems analysis which it serves, can be viewed as an application of the economic concept of marginal analysis. The analysis must always move from some base that represents the existing capability and the existing resource base. The problem is to determine how much additional resources are needed to acquire some specific additional capability, or, conversely, how much additional effectiveness would result from some additional expenditure. It is, therefore, the incremental cost that is relevant. Sunk costs are not included, and inherited assets are not costed." (McCullough, 1967)

Edward S. Quade points out that some costs may not be considered relevant for another reason that pertains to whether costs are considered internal or external.

"Costs may be relevant but they may not concern us. For example, costs falling upon hostile nations may not concern us in the same way as costs falling upon our own population. External costs are those costs of a program or decision that fall outside the boundaries of the decision maker's interest or beyond the scope of his organization. Whether a given cost is internal or external thus depends on where in the decision-making hierarchy the decisionmaker happens to be and how comprehensive his concern." (Quade, 1975)

3. Life-Cycle Costing

Following his discussion concerning incremental costing, author James D. McCullough also comments on the perspective of life-cycle costing in his contribution "Estimating Systems Costs." It is related to the time phased costing approach in that it attempts to measure a program's total cost impact over time. "Life-cycle costing results from the principle that the funds necessary to undertake a program are not the primary consideration, nor are the funds required in any particular time period, but a decision to undertake a particular course of action should take into account its total cost impact over time. The cost of developing the system must be accounted for, and the cost of procuring the system, and also the cost of operating it as a component of the force, must be taken into consideration." (McCullough, 1967)

4. Choosing a Discount Rate

To conclude this section, some attention to the choice of interest or discount rate applied in accounting for the cost of money is necessary. Several rationales concerning the choice of an appropriate rate exist and, as noted in the following excerpts, there has been no particular method that is universally accepted. "The Department of Defense currently has a 10% discount rate established by DoDI 7041.3

to be used in all economic analyses of proposed Defense investments." (D.E.A.C., 2nd Ed.) "The rationale behind the discounting process is to allow for differences in the timing of cash flow, but not for risk, and this argues for the use of a risk free or time preference interest rate. The obvious problem here is the definition and identification of a 'risk free' rate of discount." (Corti, 1973) "But, in fact, knowing what rate to use is quite a trick, one that has taken the attention of literally hundreds of economists over the past 30 years." (Gramlich, 1981) The use of judgement in the choice of a proper discount rate has led Dr. Nicholas A. Ashford to offer the following words of caution concerning regulatory decision making. The comments, however, also apply elsewhere. "Further, since the consequences of many regulatory actions may be to impose compliance costs today in order to bring about health benefits far into the future, the choice of discount rate can make one regulatory option look better or worse than an alternative. Since there is no consensus on what that rate should be, the policymaker's preference for a particular regulatory option can be hidden in the choice of a discount rate." (Ashford, 1980)

F. DETERMINATION OF BENEFITS

The next step involves identification and measurement of the benefits of the various alternatives. Most people dealing with this subject agree that measuring effectiveness

is normally more difficult than measuring costs, especially in nonprofit, government or service oriented programs or projects. In their article for The Accounting Review, authors James E. Sorensen and Hugh D. Grove point out that the literature in this area is somewhat lacking. "A widespread literature focused upon profit-oriented organizations has left the accounting literature with few operational techniques which are responsive to nonprofit service performance evaluations." (Sorensen, Grove, 1977)

In "Organizational Effectiveness: Some dilemmas of Perspective," author Robert Dubin indicates that a dichotomy exists between the use of operating efficiency and output effectiveness measures. "This distinction between social utility of output and operating efficiency is one that pervades the economy. The counterpoint of internal efficiency and social utility of output is so fundamental that almost all contemporary social problems involving organizations can be analyzed from the standpoint of this dilemma. Indeed, whenever an organization comes under attack from the outside, its leaders will defend it on grounds of organizational effectiveness quite opposite from those used as the basis of the attack." (Dubin, 1976) In his contribution titled "Measures of Effectiveness," William A. Niskanen offers two necessary characteristics of an effectiveness measure.

"The choice of these measures is the most difficult, unique problem of cost-effectiveness analysis. The appropriate measure should have two characteristics: First, and most important, it must be relevant; preferable, but less important, it should be measureable. These objectives are often conflicting. The most relevant are often very difficult to measure and vice versa. The analyst's first challenge, therefore, is to choose a better combination of relevance and arithmetic than that exhibited by most political strategists, and, for that matter, by all too many operations analysts." (Niskanen, 1967)

Probably one of the most widely respected authorities concerning management of nonprofit organizations is Dr. Robert N. Anthony. In his text Management Control in Nonprofit Organizations done in collaboration with Professor Regina E. Herzlinger, the distinction between efficiency and effectiveness measures is more reconciliatory than that proposed by Professor Dubin. They also point out the difficulty in making such measurements.

"Output information is needed for two purposes: (1) to measure efficiency, which is the ratio of outputs to inputs (i.e., expenses); and (2) to measure effectiveness, which is the extent to which actual output corresponds to the organization's goals and objectives. In a profit-oriented organization, gross margin or net income are measures that are useful for both these purposes. In a nonprofit organization, no such monetary measure exists because...revenues do not reflect true output in the same sense as a profit-oriented company. ...In the absence of a profit measure, neither efficiency nor effectiveness can be analyzed unless an adequate non-monetary substitute can be found." (Anthony, Herzlinger, 1960)

In their text, they define three basic measurement categories which may be used in the area of nonprofit or service oriented activities. The first are called results measures. "A results measure is a measure of output expressed in terms that are supposedly related to an

organization's objectives. In the ideal situation, the objective is stated in measurable terms, and the output measure is stated in these same terms. When this relationship is not feasible, as is often the case, the output measure represents the closest feasible way of measuring the accomplishment of an objective that cannot itself be expressed quantitatively. Such a measure is called a surrogate or a proxy." (Anthony, Herzlinger, 1980) The second is called a process measure. "A process measure relates to an activity carried on by the organization. ... The essential difference between a results measure and a process measure is that the former is ends-oriented, while the latter is means-oriented. An ends-oriented indicator is a direct measure of success in achieving an objective. A means-oriented indicator is a measure of what a responsibility center or an individual does." (Anthony, Herzlinger, 1980) The third type of measure is called a social indicator. These are often applied when a program or project is being evaluated from the standpoint of economic efficiency discussed in the section regarding criteria. "A social indicator is a broad measure of output which is significantly the result of the work of the organization. Unfortunately, few social indicators can be related to the work of a single organization because in almost all cases they are affected by exogenous forces, that is, forces other

than those of the organization being measured." (Anthony, Herzlinger, 1980)

The literature brings out two important points: that there are several means which may be used in measuring benefits; and that one normally encounters difficulty in any means applied. The analyst's choice of method normally will involve judgement with regard to applicability, convenience and availability of data.

G. COMPARISON OF ALTERNATIVES

1. Purpose of Evaluation

Once the costs and benefits of the alternatives have been identified, measured and recorded, a comparison or evaluation of the alternatives can be performed. The final outcome is a choice or ranking of the alternatives under the guidelines specified in the criterion for doing so. In the chapter of Analysis for Public Decisions which deals with evaluation of government programs, Quade applies the term evaluation as a means of measuring the accomplishments of an on-going or sometimes completed program in comparison to anticipated results. Such evaluations are used to propose changes in resource allocation, to improve operations and often aid in planning future activities. This type of evaluation directly pertains to the subject matter of this thesis.

a. Evaluation To Affect Resource Allocation

"Evaluation to affect resource allocation is designed to assess the worth or effectiveness of an on-going program or project in order to help determine the funds (or possibly other resources) it should be assigned. It sometimes involves a choice between using funds to continue or to end a program, but more often the decision is resource allocation at the margin--adding a little to the programs that seem to be doing well and cutting back, or not increasing, the others." (Quade, 1975)

b. Evaluation To Improve Operations

"Evaluation to improve operations is frequently done internally since its purpose is to investigate possible changes in the program with a view to improving performance, not to see how the program is doing in comparison with similar programs or in any absolute sense." (Quade, 1975) He further states that the type of data used in this area of analysis is often low-level, routine and short-range in nature.

2. Techniques

In their work Practical Program Evaluation for State and Local Governments, Harry P. Hatry and his associates offer five approaches to program evaluation. These are:

- a. Before vs. after program comparison.
- b. Time trend projection of pre-program data vs. actual post-program data.

c. Comparisons with jurisdictions or population segments not served by the program.

d. Controlled experimentation.

e. Comparisons of planned vs. actual performance.

The method of evaluation applied may be specified within the problem statement as a mandate of the decision maker or, again, it may be outlined in the criteria. When the choice is made by the analyst, it usually depends on the type of problem to be analyzed and the influence of time and resource constraints.

3. Guidelines

With regard to preferred evaluation techniques, and while drawing from the works of other contributors, Sorensen and Grove offer the following research guidelines.

a. The results of the program should be observable.

b. In any comparison of populations, samples must be created by random or systematic allocation of individuals to groups.

c. Analysis of improvements of a specific target group must be supported by comparison with similar groups which may have received different interventions.

d. Evaluation instruments must be assessed for reliability, especially for inter-rater agreement, for validity.

e. Observed differences are often small. New programs usually create only modest effects and large 'slambang' effects will be few.

When a comparison of alternatives is actually conducted, the use of a graphic format is recommended by the Defense Economic Analysis Council in their publication titled Economic Analysis Handbook.

"The proposed method of comparison of alternatives employs a graphic format. It should be emphasized that graphic analysis is not necessarily a substitute for mathematical calculations which rank the proposals. Rather, this format serves to display the results of computations in a manner which is easily understood when we have a continuum of cost and effectiveness measures. Using graphs serves two functions. First, the graphs may suggest the appropriate ranking of the alternatives over a given range of time or effectiveness, thus performing an analytic function. Second, the use of a graph allows the decision maker to see at a glance all the information which may become lost in a tabular maze." (D.E.A.C. 2nd Ed.)

This format is inherently helpful in the process of sensitivity analysis because, as mentioned, the alternatives may be compared graphically over a given range of one or more variables.

4. Sensitivity Analysis

Sensitivity analysis is, in itself, an important part of the cost effectiveness analysis process. It provides information of a dynamic nature to both the analyst and the decision maker on the acceptability of the alternatives. In the following excerpt, author G. Corti explains the use of sensitivity analysis in a financial investment context. Like

breakeven analysis, it is often helpful to display sensitivity analysis in a graphic format.

"Sensitivity analysis is a desirable first step in the appraisal of risk and uncertainty. As is well known, this is a method of testing the sensitivity of the merit of an investment. It involves revising estimates of uncertain assumptions and variables and ascertaining how such revision affects the expected profitability of a project. The idea is that management must become aware of the financial consequences of all likely outcomes before being able to make a reasoned evaluation of the worth of a project." (Corti, 1973)

5. The Final Report

To conclude an analysis, the analyst conveys his or her findings and recommendations to the decision maker by submitting a report. The final report is, of course, the end product of the analysis. It documents and communicates the work done by the analyst to the decision maker. It should therefore contain a logical representation of the analysis performed and provide understandable findings. The report should also be detailed and complete.

"'Documentation' is essential. If numbers are arrived at or critical sources used, then by all means document the work already laboriously done. The time spent in having numbers, equations, models, or judgements which have been omitted from a report explained fully to a manager is one of the most wasteful kind of 'drills', about which I know only too well. Endless hours of discussion and clarification can be avoided by including them." (Cornell, 1980)

H. PROBLEMS AND CONCLUSIONS

1. Problems in Cost Effectiveness Analysis

Before concluding on the subject, we consider it appropriate to discuss some of the more common problems or misgivings concerning cost effectiveness analysis. These include: (a) time and resource constraints, (b) the presence of judgement, (c) quantifiability of factors, (d) political constraints, and (e) uncertainty.

a. Time And Resource Constraints

The effects of time and resource constraints pervade an analysis. These constraints greatly affect the validity and completeness of information used within the analysis. They also may result in the use of judgement which poses a problem in itself.

"Time money and other costs obviously place severe limits on how far any inquiry can be carried. The very fact that time moves on means that a correct choice today may soon be outdated by events and that goals set down at the start may not be final. This is particularly important in public policy analysis, for usually the decision-maker can only wait a very limited time for an answer. The costs of delay may be of more consequence than the benefits of further inquiry because the time at which the decisions can be made successfully may pass rapidly." (Quade, 1975)

b. The Presence of Judgement

"Human judgement is used in designing the analysis, in deciding what alternatives to consider, what factors are relevant, what the interrelations between these factors are, and what numerical values to choose, and in interpreting the results of the analysis. This fact--that

judgement and intuition permeate all analysis--should be remembered when we examine the results that come, with apparent high precision, from analysis." (Quade, 1967) Whenever judgement is used, there is also the possibility that either willful or unconscious bias may be present.

c. Quantifiability Of Factors

Professor Alan Williams uses the following comments to answer the question: Is cost benefit analysis precise? "...such is the strength of the influence of the scientific sub-culture with our society, that quantifiable things tend to take precedence over non-quantifiable things, and hence undue weight tends to be given to the insignificant things that CBA is able to measure with precision, while the crucial unmeasurables get neglected." (Williams, 1973) This problem particularly presents itself in the process of measuring effectiveness when measurable proxies are used in the place of more meaningful factors. "However, if some of the important factors can be reduced to quantitative terms, it is often better to do so than not to do so. The resulting analysis narrows the area within which management judgement is required, even though it does not eliminate the need for judgement." (Anthony, Herzlinger, 1980)

d. Political Constraints

When analysis is applied in the area of governmental activities, there is the additional problem of the influence of politics. "Public policy is made in a

political environment. It affects, to a greater or less degree, what problems are analyzed, who does it, how it is done, what decisions are made as a consequence, and how those decisions are implemented. Policy analysis must thus cope with politics." (Quade, 1975)

e. Uncertainty

Again, we turn to comments made by Edward G. Quade in his text Analysis for Public Decisions regarding uncertainty. He states the major pitfall is to neglect uncertainty by assuming it away and presenting an over simplified problem as one of certainty. "It is also not enough just to acknowledge that uncertainties exist and to warn the user that some things have been left out of a study because of the lack of information. We must have high confidence that the omissions do not have critical a (sic) effect on the final outcome of the study. The user, if not the analyst, has to come to grips with these omitted factors or issues and he needs to know what their effects are likely to be, how likely they are, when he can expect them, and what he might be able to do about them." (Quade, 1975) Sensitivity analysis is often applied, along with regression analysis and other statistical techniques, to show the effects of changing assumptions or conditions on the acceptability of alternatives under uncertainty.

2. Conclusions

In our concluding remarks, we first wish to make the brief point that an analyst should not be prevented from making his or her own conclusions and recommendations in an analysis. "It is important for the analyst to distinguish carefully between what a study actually shows and the recommendations he or she may make on the basis of what he or she thinks the study implies. But, having clarified that point, the analyst should not be prevented from making recommendations or, at the very least, from drawing some conclusions." (Cornell, 1980)

The purpose of this chapter has been to discuss the procedures and techniques applied in cost effectiveness analysis and to identify some of its inherent problems. What is cost effectiveness analysis? It involves practical application of scientific methods. It is a mixture of, on the one hand, objectivity, traceability through proper documentation and a logical sequence of steps; on the other hand, it involves subjectivity, judgements and real world constraints. It is a social science and may often result in suboptimizing instead of the ideal of optimization.

The techniques and procedure outlined in the review of the literature will provide the foundation for the analysis that follows. Because problems and the techniques used to solve them differ greatly in their nature and scope, not all analysis can be conducted and documented in one

precise fashion. That is why the literature often provides general guidelines rather than a more precise methodology. Within the process, however, we will attempt to follow the logical step by step format and adhere to the guidelines that are given in this chapter where they apply. In this regard, we shall first identify the specific problem, the alternatives and criterion in the following chapter. Within that chapter, the relevance of the distinction made between criteria that involve economic efficiency issues and other, lower level criteria will become evident in the discussion concerning the scope of the problem and selection of the criterion. The measurement phase, which includes the process of identifying and measuring cost and effectiveness factors will then be documented in chapters four and five respectively. The evaluation phase will be displayed in the following chapters. The process will then culminate in the last chapter, which contains our findings and recommendations.

III. SPECIFICATION OF PROBLEM, ALTERNATIVES AND CRITERION

A. INTRODUCTION

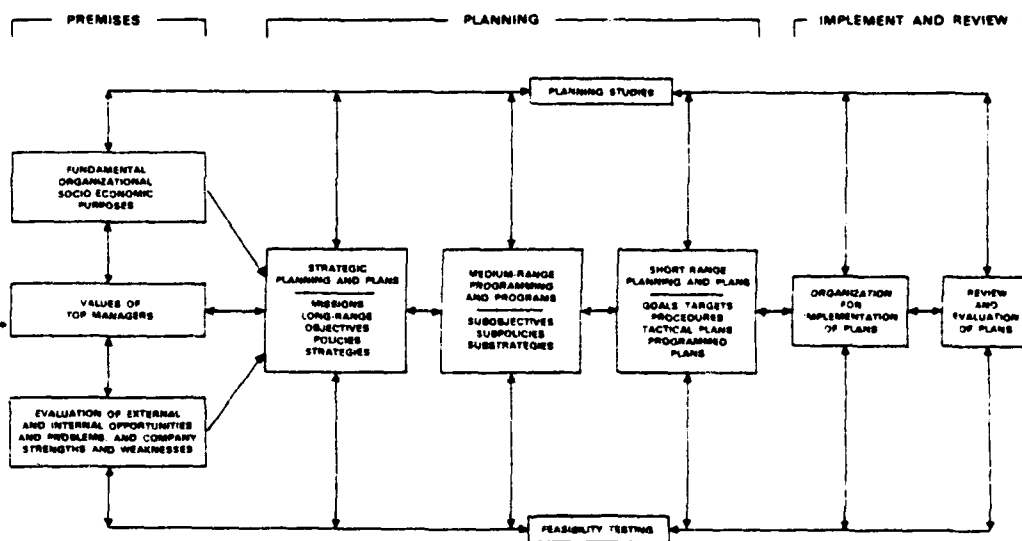
This chapter will provide a discussion of the actual problem situation as we perceive it, an identification of the alternatives and the criterion to be employed during the evaluation phase of our analysis. Given the general information contained in chapter one concerning the background and purpose of the Coast Guard's CVS program, and the basic cost effectiveness analysis methodology discussed in chapter two, we can now direct our attention to the more specific factors involved in this analysis.

1. Purpose

This and other types of analysis are classified as "planning studies" by author George A. Steiner in his conceptual model of planning which is reproduced in figure III-1. The figure indicates how planning studies interact with other planning activities. These studies provide various types of information to management and "are usually basic premises which are of high significance in guiding the planning process." (Steiner, 1969)

The concept of a planning study is similar to, but more general than, that of program evaluation referred to in chapter two. Although both are management tools used in the planning process, a program evaluation more specifically

FIGURE III-1
Structure and Process of Business Planning



Source: Top Management Planning by George A. Steiner, 1969

deals with measuring the accomplishments of an ongoing or completed program. In a letter of promulgation dated 5 November, 1968, the then Coast Guard Commandant, Admiral W. J. Smith indicated his view concerning the purpose of what he called special analytic studies. "Special Analytic Studies form an integral part of our Planning, Programming, and Budgeting System. These studies analyze feasible alternative policies and procedures for conducting old programs or for solving new problems. In this way they provide top management at Headquarters with a sound analytical base for decisions which allocate resources, control relative program emphasis, and direct the Coast Guard's course into the future." (Smith, 1968) It is the purpose of this thesis to provide information and analysis which may be useful to CVS program planners and managers with regard to the inspection of U.S. flag vessels in foreign countries as an ongoing Coast Guard function.

2. Scope

In order to understand the relative scope of this particular analysis, it may be helpful to look at some recent studies that have dealt with the cost and/or effectiveness aspects of government or Coast Guard regulation. An analysis titled "A Study of Costs, Benefits, Effectiveness of the Merchant Marine Safety Program" which was conducted by the Coast Guard and published in 1968 focused on program

effectiveness. This analysis compared in-house program costs including both vessel inspection and personnel licensing functions versus estimates of lives saved as a result of these functions. Among other things, the study group concluded that the CVS program is highly effective in preventing a significant amount of deaths, injuries and property damage. In a study titled "How Effective is the Coast Guard in Carrying Out its Commercial Vessel Safety Responsibilities?" which was submitted to Congress by the General Accounting Office in 1979, an evaluation of CVS program efficiency and effectiveness was conducted with a number of recommendations made to correct current problems and effect general improvements in operations. The general problems are referred to in chapter one. The scope of this study is somewhat similar to the Coast Guard analysis in that the latter considered several functions within the CVS program including inspection, licensing, efforts to comply with international agreements, and in-house training and staffing. There was, however, little emphasis on the identification and measurement of program costs in this study. A study of similar scope but with an emphasis on costs titled "Commercial Vessel Safety Economic Costs" was published later in 1979 by the Planning Research Corporation Systems Services Company. This study was concerned with a broad economic assessment of the costs and cost impacts of Coast Guard regulations. Together with the follow-on reports

submitted in 1980 concerning an economic assessment of benefits, it is probably the broadest in scope regarding evaluation of costs and benefits of the studies herein being referred to. It is also similar to one by author John Cameron which was submitted by Ernst and Whinney to the U.S. Maritime Administration of the same year. The work titled "Cost Impact of U.S. Government Regulations on U.S. Flag Ocean Carriers" contains an evaluation of the cost impacts of federal regulations on the U.S. shipping industry rather than the economy as a whole. It does however consider other agency regulations in addition to those enforced by the Coast Guard.

An interagency study by the Department of Transportation, Coast Guard and the office of Management and Budget was completed in March, 1982, titled "Coast Guard Roles and Missions". It contains a comprehensive review of Coast Guard programs including commercial vessel safety with emphasis on functions that the study group concluded should be performed, reduced, eliminated or delegated to other agencies or private organizations. It is considered rather broad in scope in that it deals with overall strategies concerning the CoastGuard in the future.

Compared to the other studies, our analysis is of relatively limited scope. We are dealing with a problem which pertains to a particular aspect concerning one of the

major functions within one Coast Guard program. The analysis focuses on vessel inspections in overseas locations. Our concern therefore is not total program cost effectiveness due to the limited nature of the problem. A study of this nature is more like an internal analysis concerned with a rather specific, mid-level problem that is conducted by staff personnel to provide information used in decision making.

B. PROBLEM SPECIFICATION

The essential problem addressed in this thesis will be formally introduced in this section. The Coast Guard performs CVS duties involving U.S. flag vessels wherever these vessels may be located on a continuing basis. Activities include new construction, conversion, periodic inspections, drydock examinations and shop tests of safety equipment. During the past decade, the Coast Guard opened several overseas inspection offices having permanently assigned personnel to carry out these activities in particular areas. The areas assigned to these offices included Europe, Africa, the Middle East and Far East. Other areas have been the responsibility of offices located in the United States except for activities in Puerto Rico and the Virgin Islands. During April of 1982, all of the major overseas offices were closed as a result of federal budget cuts carried out during that period. Offices or detachments in Rotterdam Netherlands, Yokohama and Kobe Japan, Singapore

and Guam were closed, and most of the personnel billets were discontinued in the effort to expeditiously cut costs. The activities previously carried out by those offices were assigned by geographic area to various offices located throughout the United States as noted in chapter one.

Conceptually, the closures have raised the possibility of several related problems, the most important and general one being a decrease in the level of effectiveness in the performance of CVS functions overseas. It should be made clear at this point that changes in effectiveness are perceived to be a potential problem only. Due to the closures and with the continuation of user fees, requiring reimbursement of travel and subsistence expenses, the Coast Guard has, on the other hand, enjoyed some savings in cost. The cost savings however, may or may not have compensated for changes in effectiveness. The level of effectiveness is related to several factors including:

1. Quality of vessel inspections performed overseas. Of the factors included, this is considered to be the most important because it is most directly related to the attainment of safety of life and property goals.
2. With an increase in the amount of travel, there is an increase in manhours attributable to unproductive travel time. This reduces the availability of personnel both at their permanent station and overseas. Personnel may be

especially unavailable for overseas emergencies on short notice.

3. Performance of duties by personnel on a temporary duty status has made the duration of visits more short-term in nature. As a result, there is a strong possibility for less consistency and cohesiveness in long-term jobs such as vessel construction because several persons may become involved. The importance of this factor has decreased as a result of delegation of new construction duties to the American Bureau of Shipping.

4. Planning and scheduling is required both of the local Coast Guard office managers and vessel owners and operators due to lead times involved. This itself takes time and effort.

5. On-the-job training of personnel is affected by the office closures because only qualified personnel should now be sent overseas where they work under rather autonomous conditions. The resulting effect, however, depends on the amount of training conducted at the overseas offices while in operation.

6. Morale is affected because personnel are sometimes separated by great distances from their families at short notice and for extended periods.

Of particular importance is the fact that an analysis was not conducted at the time of the overseas office closures for

the prediction of changes in cost and effectiveness. The problem therefore stems from the existence of uncertainty concerning the effects of the closures on CVS program cost and effectiveness. It is our objective to provide comparisons, of both cost and effectiveness under two significantly different methods of operation and to determine if effectiveness remains within reasonable limits.

C. THE ALTERNATIVES

Although there may conceivably be an infinite number of alternatives that could be considered, we have elected to compare what we consider to be the two basic alternatives that have fostered the uncertainty discussed in the preceding section. Other alternatives will be identified but will not be evaluated due to the specific nature of the problem and due to time, data and resource constraints. The two general alternatives that will be considered in this analysis are listed below. Other alternatives that may be considered feasible include factors such as the opening of a greater or lesser number of overseas offices than had been in operation, the placement of offices in different locations and the employment of a different number or rank structure of personnel that had been stationed overseas. Whether or not user fees should be charged is another issue affecting the range of alternatives. Solving complex problems having a large number of alternatives normally involves the use of

operations research techniques. One alternative that is considered infeasible involves the discontinuance of overseas functions altogether. The Coast Guard must enforce the laws that are passed by Congress and assigned as its responsibility. This is an assumed legal constraint.

1. Continue Present Operations

The basic process begins with a request from a vessel's owner or operator for an inspection overseas. A person stationed within the United States at the office responsible for the particular area is then assigned. Personnel are sent overseas to perform individual or a small number of inspections over periods of usually six weeks or less. They are issued temporary additional duty (TAD) orders and normally draw a portion of their travel and subsistence funds in advance with any additional funds reimbursed after the trip. Under this alternative, the overseas offices would remain closed. The present user fee system would remain in effect. This particular user fee system requires reimbursement of an inspector's allowable travel and subsistence expenses by a vessel's owner or operator. Its establishment in 1980 was based on the premise that those who most directly benefit from government services should pay for all or part of the costs incurred.

2. Reopen the Overseas Offices

This alternative involves the reopening of the same offices that were closed in 1982 and the continuance of the

present system of user fees applying also to alternative one. The type of facilities, their size, location and staffing levels would be equal to that which was employed just prior to the closures.

D. CRITERION

As discussed earlier in this chapter, the scope of this analysis is considered to be somewhat below the conceptual level normally calling for an economic efficiency criterion. The purpose of a criterion, as noted in chapter two, is to make an objective comparison between alternatives under specific decision rules. Because we anticipate unequal amounts of both cost and effectiveness to be measured under each alternative, the more common fixed cost/maximum effectiveness or fixed effectiveness/minimum cost criteria cannot be applied. The criterion used in this analysis involves minimization of the ratio of cost to effectiveness for each alternative. The level of effectiveness attributable to each alternative should itself be evaluated so it can be determined whether or not it lies within acceptable limits. Evaluation of the alternatives is documented in chapter seven. In the following two chapters, the cost and effectiveness of each alternative will be identified and measured.

IV. DESCRIPTION AND MEASUREMENT OF COSTS

A. INTRODUCTION

The purpose of this chapter is first to identify and classify the various costs that pertain to the Coast Guard Commercial Vessel Safety program operations overseas which are relevant to the alternatives. A description of the several categories of costs is contained in the following section. The costs will then be tabulated in section C of this chapter so that they may subsequently be used in the evaluation of the alternatives. We have elected to tabulate costs on a quarterly basis within the fiscal years for two reasons. Firstly, because the overseas offices were effectively closed in April of 1982, which is near the mid-point of the fiscal year, the cost and effectiveness results attributable to the period would be significantly affected by factors contained in both alternatives. A clear separation of the costs and effectiveness attributed to each alternative is necessary for a meaningful comparison or evaluation to be conducted. Secondly, a quarterly breakdown may prove helpful in the identification of recent trends which may otherwise not be apparent in an annual or semi-annual breakdown unless data is available that spans a number of years.

It is often the case that cost effectiveness analysis is applied to situations where the choice of a new project or program is contemplated. This means that alternative courses of action have not yet been put into operation, and the analysis is therefore future oriented. In these situations, costs are normally estimates of future costs which would be incurred if a particular alternative were instituted. Estimates of future costs are, of course, often based on historical data. There is however a unique feature of the present problem. Our analysis compares two alternatives that have already been in operation in the recent past. The various overseas marine inspection offices were in operation until April, 1982. Since that time, all overseas Commercial Vessel Safety duties have been carried out by inspection personnel travelling TAD from offices located in the United States. We have therefore chosen to base the determination of costs of the alternatives on data derived from operations occurring in fiscal 1981, 1982 and the first two quarters of 1983, and to consistently use a past rather than future orientation. This orientation is sometimes used in situations, like this one, that evaluate on-going programs for the purpose of improving either program efficiency or effectiveness. There are two advantages in adopting this orientation within the context of our analysis: (1) actual and standard cost data is available that pertains to both alternatives, and (2) data pertaining to the effectiveness of

the alternatives has also been obtained within the same time frame.

It should also be pointed out that only those costs incurred by the Coast Guard and attributable to the CVS program are of primary concern here. There may be other costs indirectly incurred by other agencies which could be affected by the alternatives. An example is a change in State Department costs of an overseas embassy due to the administration of government personnel stationed there. The costs incurred by the various shipping companies that are our customers and which pay for the services they receive via user fees are very significant but will not be considered within the basic evaluation. Shipping companies that receive Coast Guard services in foreign countries under the Commercial Vessel Safety program have been required by law to reimburse the government for travel and subsistence expenses incurred by the Coast Guard. This requirement was first contained in 46 US Code 3826-1 which became effective October 3, 1980, and subsequently recodified under 46 USC 3317 (b) with passage of Public Law 98-89 in 1983. In closing, there are a number of assumptions made that are related to the identification and measurement of costs in this chapter. These assumptions are identified and explained in the following section.

B. CLASSIFICATION OF COSTS

There are five major categories of costs which pertain to the alternatives. Each will be discussed separately within this section.

1. Overseas Offices Operating Costs (COCC)

The first category of costs are those that were regularly incurred to operate the various Commercial Vessel Safety units located in foreign countries prior to their closure. Under the premise that this has been an on-going program, any startup costs that may have occurred in the past are not included. Nonrecurring costs that may have been incurred for the actual closure of the overseas offices are also not considered to be relevant. For this reason, only the actual quarterly operating costs reported prior to the formal closing date of the overseas offices will be used. Under this category of costs, actual operating expenses obtained from internal Coast Guard comptroller division reports will be utilized within the separate time compared. These costs are only pertinent to alternative 2.

2. Incremental Personnel Moving Costs (IPMC)

This category includes the incremental costs incurred to permanently transfer personnel to and from the United States over and above the cost for an equal number of transfers made completely within the United States. A form of average costs will be used in this category because we

believe a computation attempting to measure actual costs would be difficult and cumbersome. For any particular transfer, actual moving costs are affected by a person's rank, distance travelled, and number of dependents. It is therefore more practical to use standardized costs within this category.

Given the billet structure that existed for the overseas offices prior to their closure, the incremental moving costs will be computed based on the following assumptions: (1) that each tour of duty is three years in duration, (2) even though the overseas offices were closed so that savings could be realized through elimination of the personnel billets, we are assuming a constant force level. In this regard, it is assumed that the personnel and billets that existed in the far east were reassigned to the Marine Safety Office, Honolulu, and the personnel and billets at the Rotterdam office were reassigned to Marine Inspection Office, New York. Standard moving costs are computed under two basic categories, INCONUS and OUTCONUS (referring to moves that occur within the Continental U.S. or not). Under the Coast Guard's system of Standard Costing, savings in moving costs are only realized where CVS personnel that had been stationed overseas are relocated within the Continental United States. The incremental costs are the difference between the costs

computed for overseas and domestic transfers and only pertain to alternative 2.

3. Incremental Living Allowances (ILA)

The incremental living allowances are those paid by the Coast Guard to personnel stationed overseas over and above any such allowances that are paid to personnel stationed within the United States. Like moving costs, these allowances are affected by a number of factors including rank, number of dependents and location of duty. Due to the complexity of computing actual costs, a form of standardized costs will be used to compute the differential in living allowances paid to overseas personnel. The assumption listed above concerning relocation of overseas billets and the savings realized under the standard cost system will also be applied within this category. These costs would only be incurred under alternative 2.

4. Lost Time To Travel Cost (LTTTC)

There is a significant amount of time spent travelling in almost every overseas CVS function performed except for those that occur in the local area of an overseas office. Even the personnel that were stationed overseas spent a considerable amount of time travelling to distant locations that were within the particular geographical jurisdiction of their office. If one considers the time spent travelling beyond a local area as unproductive, then there is a cost attributable to this lost time. It is considered

an opportunity cost because the time could have been spent in the actual performance of commercial vessel safety duties. We are not necessarily trying to say that this travel time should be minimized merely because it is labeled unproductive, but one must realize that there is a cost involved. Many organizations grapple with problems of this nature when attempting to allocate their resources in an optimal manner. A Marine Inspection Office in every port and near every shipyard would definitely cut down on lost time due to travel, but the operating costs of these offices would be enormous. On the other hand, sending personnel from the United States on a temporary duty status to conduct all commercial vessel safety functions overseas greatly increases the costs attributed to unproductive travel time while decreasing operating costs. A trade-off between these costs is an essential part of the decision making process.

Travel time costs are computed using two factors: actual manhours lost to travel and standard personnel costs. A travel claim is normally submitted in every case that requires personnel, stationed overseas or in the United States, to perform commercial vessel safety duties that involve travel outside a local area. The entire amount of time spent during temporary additional duty is accounted for in the standard travel claim under various categories. The time that is coded TDY in a claim is considered the amount

of time actually available for the performance of duties and is labeled manhours available for work or MHAW within the data we have assembled. A portion of this time may be considered "unproductive" such as meal time and regular off hours but it does not pertain to lost time due to travel which concerns us here. For each claim submitted, the manhours lost to travel or MHLT is computed by subtracting the time available for work from the total time reported not including time on leave status. The lost time to travel can then be aggregated under a particular fiscal period by rank. This is converted to an equivalent amount of manyears and multiplied by the standard personnel cost for a particular rank. The lost time costs for the various ranks are then summed to determine the total cost under a particular time period. These costs are pertinent to both alternatives because both domestic and foreign personnel submit travel claims for overseas inspections although in different amounts. The standard personnel costs are listed in table IV-1.

The formula used to compute LTTC for a particular rank and within a particular quarter is:

$$LTTC_{\text{rank}} = ((\sum_{\text{qtr}} MHLT_{\text{rank}}) / 1688) (SPC_{\text{rank}})$$

The total LTTC for a particular quarter is :

$$TLTTC = \sum_{\text{qtr}} LTTC_{\text{rank}}$$

where:

LTTC = lost time to travel cost.

MHLT = manhours lost to travel.

1688 = a factor used by the Coast Guard in projecting its CVS staffing requirements that is based on a 211 day work year of 8 hours per day (after accounting for leave, holidays, etc). This factor is used to convert manhours to manyears.

SPC = the standard personnel cost computed for each fiscal year by rank. These figures are listed annually in Commandant Notice 7100, Standard Personnel Costs.

Table IV-1

Standard Personnel Costs (SPC)

RANK	FY81 \$	FY82 \$	FY83 \$
E-7	22,100	26,600	27,800
E-8	25,000	30,100	31,500
E-9	28,600	34,500	36,100
W-2	24,000	27,700	29,000
W-3	28,000	32,300	33,800
W-4	33,000	38,100	40,000
ENS.	17,400	20,100	21,100
LTJG.	24,000	27,700	29,000
LT.	29,300	33,900	35,600
LCDR.	35,000	40,600	42,500
CDR.	41,300	47,900	50,300
CAPT.	49,800	57,700	60,500
GS-11	22,800	23,900	24,600
GS-12	26,951	28,245	29,374
GS-13	32,200	33,800	34,900

Source: Commandant Notice 7100, Standard Personnel Costs, distributed annually.

5. Billing Lag Time Costs (BLTC)

The final category involves the cost of money to the Coast Guard that is imputed as a result of normal administrative delays in billing customers for our overseas CVS services and in the receipt of payments. Four assumptions are applied in the computation of these costs. The assumptions are: (1) that all personnel receive advance per-diem and travel funds just prior to their departure on temporary duty, (2) that the advances in funds are equal to the actual funds payable, (3) that the Coast Guard receives payment for their services 34 days after the date of a bill, (4) that the appropriate interest rate to apply in the computation is the same rate applied by the Coast Guard in a particular time period for overdue payments.

It is not very difficult to argue that persons going on TAD (temporary additional duty) receive advances of at least a major portion of the estimated funds authorized for a trip. This normally includes the purchase of an airline ticket. Whether the advances actually equal the amounts authorized is much less certain. The second assumption however is necessary to allow a workable estimation of the billing time costs. The 34 day time lag is assumed for two reasons. First, there is an incentive for customers to pay a bill exactly 30 days after receipt. The Coast Guard specifies on

the bill that the amount is due within 30 days of receipt and charges interest thereafter. There is, therefore, no incentive to pay earlier than within the 30 days allotted but there is a strong incentive not to go beyond this limit. The additional 4 days are attributed to the time it takes to deliver or mail a bill to a customer. Billing dates are known but the date a customer receives the bill is not known. Because the date of receipt is used to begin the 30 day payment period, a reasonable amount of time to deliver the bills must be assumed. The problem of choosing an appropriate interest rate in computing the cost of money was discussed earlier in Chapter II. We believe the rate applied by the Coast Guard in charging for overdue bills is appropriate. These rates are current in that they are published by the Treasury Department on a quarterly basis and they are the same rates that the Coast Guard would realize in the collection of past due amounts. The applicable interest rates are listed in table IV-2.

TABLE IV-2

Quarterly Interest Rates

Qtr	Rate		Qtr	Rate
1-81	13.14	|	2-82	14.39
2-81	13.14	|	3-82	13.22
3-81	17.64	|	4-82	14.26
4-81	16.20	|	1-83	12.00
1-82	18.35	|	2-83	13.00

Applying the assumptions just mentioned, billing time costs can be computed as follows: The funds pertaining to any particular bill are considered to be "out of pocket" from the date an overseas trip is begun until a customer's payment is received. The amount of time used in the computation regarding each amount billed is then the number of days between the date of departure and the bill date plus 34 days. The total time lag aggregated in a particular fiscal period is converted to an equivalent amount of years and multiplied by the interest rate matched with that period to obtain a billing time cost. Due to the fact that bills are issued for overseas services provided by either domestic or foreign based personnel, billing time costs can be attributed to both alternatives before the overseas offices were closed and to alternative 1 subsequent to the closures.

The formula used to compute BLTC for a particular quarter is:

$$BLTC = \left[\sum_{qtr} ((BDBD+34) / 365)(AMTB) \right] (IRATE)_{qtr}$$

where:

BLTC = billing lag time cost

BDBD= the number of days between an inspector's departure date and the date of the bill concerning a particular trip.

365 = a factor used to convert the number of days to an equivalent amount of years.

IRATE = the interest rate used within a particular fiscal quarter.

AMTB = the dollar amount billed for reimbursement of a particular overseas inspection within a particular fiscal quarter.

A major item of cost, that of basic personnel salaries and allowances, is considered to be irrelevant because those persons performing commercial vessel safety duties overseas would continue to be paid this amount whether they are stationed in the United States or overseas. This implicitly assumes the number of personnel within the program is equal for each alternative. Any field level personnel reductions that may have occurred at about the same time the overseas offices were closed can be attributed to projected decreases in workload due to the delegation of inspection duties to the American Bureau of Shipping. Program administrative costs are also assumed to be irrelevant because, although program administration may entail differing functions under each alternative, total costs are considered to be approximately equal. In support of this assumption, we found no evidence of administrative personnel reductions or increases at the headquarters or district level that directly resulted from the closure of the overseas offices in 1982. The computations of relevant costs that have been identified in this section will be displayed in the following section.

C. DETERMINATION OF COSTS OF THE ALTERNATIVES

In this section, the costs attributable to each of the alternatives will be tabulated under the five categories of costs identified in the preceeding section. The quarterly

(fiscal) totals will then be summarized in 1982 dollars to facilitate comparisons of the alternatives in chapter seven.

1. Overseas Office Operating Costs, By Quarter (0000)

Table IV-3

Overseas Office Operating Costs, by Quarter (0000)

	1-81	2-81	3-81	4-81	1-82	2-82
Rotterdam:	19845	29197	13888	11569	8454(1)	12439
Kobe:	20463	17943	19764	12981	21187(1)	16578
Singapore:						
actual	--	106	120555	20133	27323(2)	27323
yr. aver. (3)	35198	35199	35198	35199	27323	27323
Guam:						
total	15465	11934	10637	6525	9248(1)	7167
CVS port. (4)	6240	4836	4292	2557	3732	2892
TOTAL:						
(rows 1,2 4,6)	81746	87175	73142	62406	60696	61232

(Source: Coast Guard Reports "Operating Costs of Coast Guard Marine Safety Offices")

NOTES TO TABLE IV-3:

(1) Because the individual first quarter FY82 figures are not available, the amounts were extracted from the second quarter cumulative figures at the same ratio that exists between the two quarters in FY81 for each office except Singapore.

(2) Because the first quarter FY82 figure was not available, and due to the irregular FY81 cost pattern, the amounts

listed are one half of the second quarter FY82 cumulative total.

(3) Due to the irregular pattern of expenses reported for the Singapore office, the actual amounts for FY31 are averaged.

(4) Because the Marine Safety Office in Guam had other than CVS duties assigned to it, only a portion of the total costs are allocated to the CVS program. The 40.35% allocation rate is found in the Coast Guard's "distribution of resources" table tabulated by the budget division for 1981 for allocating costs of an average Marine Safety Office to the CVS program.

(5) These costs apply only to alternative 2.

2. Incremental Personnel Moving Costs, by Quarter (IPMC)

Given the actual billets assigned to the overseas offices as of 31 January 1982 that are listed below in table IV-5, and applying the assumption that only personnel billets assigned to Rotterdam would be relocated in the Continental U.S. as discussed in the previous section, an estimation of the incremental personnel moving costs can be made. The average quarterly cost is shown below in table IV-4 computed in 1982 dollars. The average incremental cost per billet listed in column three is the difference between the average OUTCONUS recurring cost per billet and the average INCONUS recurring cost by billet type which were taken from the 1982 Coast Guard Standard Personnel Cost data. Only 1982 average

figures are used because later cost comparisons will be made in 1982 dollars, and because the 1981 figures were not based on actual cost data but were merely earlier figures projected forward with inflation factors applied.

Table IV-4

Average Quarterly Incremental Moving Cost

Billet type	Number of billets	Avg. Incremental cost per billet	Annual cost	Quarterly cost
-----	-----	-----	-----	-----
Officers	2	5562.00	44,496.00	11,124.00
Civilians	2	560.00	1,120.00	280.00
IPMC total				
per quarter				<u>11,404.00</u>

NOTE: The cost only applies to alternative 2.

Table IV-5
Overseas CVS Billets

	Number	Rank
Rotterdam:	1	Commander
	2	Lieutenant Commander
	3	Lieutenant
	2	Warrant Officer (W4)
	2	Civilian (GS-1)
Singapore:	1	Commander
	1	Lieutenant Commander
	1	Lieutenant
	1	Warrant Officer (W4)
Kobe:	1	Captain
	1	Lieutenant Commander
	1	Lieutenant
	1	Lieutenant (jg)
	2	Warrant Officer (W4)
	1	Yeoman Chief (YNC)
	1	Petty Officer (SKI)
Yokohama:	1	Lieutenant Commander
Guam:	1	Lieutenant Commander
	1	Lieutenant (jg)
	1	Yeoman Chief (YNC)

3. Incremental Living Allowances by Quarter (ILA)

The incremental amount of living allowances is that amount paid to overseas personnel which exceeds the amount paid to personnel stationed within the Continental U.S. Two types of allowances are paid to military personnel stationed outside the Continental U.S. These are a cost of living allowance (COLA) and a housing allowance (HOLA). Our estimate of these costs is tabulated below in table IV-6 using 1982 annual average figures for officers taken from the consolidated monthly reports of COLA and HOLA allowances overseas, form CG-3376. The average per person figures for 1982 are based on actual 1982 cost data compiled by the planning and evaluation staff under the Office of Personnel at Coast Guard headquarters. The assumption that only Rotterdam billets are relocated within the Continental U.S. under alternative one is again being applied as it was in estimating incremental moving allowances.

Table IV-6
Average Quarterly Incremental Living Allowance

Billet type	Officers	
Average COLA per person per month		191.00
Average HOLA per person per month		413.00
Total per month per person		<u>604.00</u>
Total per Quarter per person		1812.00
Number of officers		8
Total ILA per quarter		<u>14,496.00</u>

NOTE: This cost applies only to alternative 2.

Table IV-7
Lost Time Due to Travel Cost by Quarter

RANK	ALTERNATIVE 2 ←						→ ALTERNATIVE 1			
	FISCAL QUARTER									
	181	281	381	481	182	282	382	482	183	283
E-7	-	-	-	-	-	-	670	698	571	3,297
E-8	-	-	-	-	-	-	-	-	-	-
E-9	-	-	-	-	-	-	-	-	-	-
W-2	145	2,342	5,791	2,741	4,895	1,936	3,542	22,023	7,951	11,095
W-3	893	383	620	6,306	2,051	2,448	6,025	880	4,605	1,352
W-4	1,056	1,185	3,182	607	2,601	1,258	576	4,010	16,357	3,406
O-1	-	-	-	-	-	-	-	738	2,223	725
O-2	562	3,850	526	6,286	3,724	1,410	4,769	17,644	14,158	13,289
O-3	12,144	17,436	22,097	12,600	25,482	31,469	16,764	35,150	49,513	49,735
O-4	2,703	5,796	17,490	17,332	12,814	24,645	10,594	13,707	7,009	11,823
O-5	2,525	954	7,897	29,772	4,032	6,945	894	-	-	3,476
O-6	1,077	643	-	1,906	4,273	3,846	-	2,801	-	-
GS-11	-	1,459	-	-	-	-	-	-	-	-
GS-12	319	-	1,381	-	-	941	-	1,027	-	976
GS-13	-	-	-	-	-	-	-	-	1,473	-
TOTAL	21,424	34,048	58,974	76,550	59,872	74,798	43,934	98,678	103,875	99,174

4. Lost Time Due to Travel Cost (LTTC) by Quarter

The actual costs attributed to travel time under overseas inspections were computed using the formula identified in section B of this chapter and are tabulated below in table IV-7. These quarterly costs were computed by personnel rank and are in current dollars.

5. Billing Lag Time Costs (BLTC) by Quarters

The imputed costs attributed to administrative billing lag time were computed using the formula identified in section B of this chapter. These costs are tabulated below in table IV-8 for each of the two alternatives on a quarterly basis.

Table IV-8

Billing Lag Time Costs by Quarter

Fiscal Quarter	ALT 1	ALT 2
1-81	—	3901
2-81	—	6821
3-81	—	15060
4-81	—	12560
1-82	—	7037
2-82	—	7258
3-82	5857	—
4-82	11083	—
1-83	8726	—
2-83	8251	—

NOTES: (1) Figures are uncorrected for inflation.
(2) Figures are rounded to nearest dollar.

This corresponds to the approximately linear portion of the curve in figure V-1 shown in box number one where constant returns to a variable input are realized.

Table V-2

Rank Codes

RANK	CODE	RANK	CODE
E-7	2.7	A-4	3.0
E-8		O-3	
E-9			
W-3	2.8	O-4	3.1
O-1			
W-3	2.9	O-5	3.2
O-2		O-6	3.3

3. Number of Personnel

Even though, in our data, the number of personnel involved in an inspection ranges from one to six, we assume the resulting range of effect of this input on quality to be relatively wide. In a very narrow range, usually one to three persons, inspection quality increases due to the additive effect of personal experience and expertise. Beyond a certain point, however, inspection quality would decline, even though there may be added benefits in the area of training unqualified persons. It is difficult to determine a point where diminishing and negative returns takes place due to an increase in the number of attending personnel.

6. Total Operating Costs Under Each Alternative,
by Quarter

The following table contains the totals of the five costs attributable to each alternative per quarter. For alternative 1, total costs consist of the sum of LTTC and BLTC. For alternative 2, total costs consist of the sum of all five categories of cost, COOC, IPMC, ILA, LTTC, and BLTC. These totals have been converted to second fiscal quarter dollars using the implicit price deflators for gross national product that are computed by the Federal Reserve Bank of St. Louis and published monthly in the magazine "National Economic Trends." These deflators are compounded annual rates of change computed on a quarterly basis.

Table IV-9

Total Operating Costs For Each Alternative by Quarter

Fiscal Quarter	ALT 1	ALT 2
1-81	—	143,343
2-81	—	164,874
3-81	—	186,057
4-81	—	189,125
1-82	—	160,106
2-82	—	169,188
3-82	46,908	—
4-82	104,712	—
1-83	107,647	—
2-83	102,483	—

V. DESCRIPTION AND MEASUREMENT OF EFFECTIVENESS

A. THE EFFECTIVENESS MODEL

In this chapter, we will attempt to provide a measure of the effectiveness of each alternative that is both objective and meaningful. Some of the common problems associated with measuring effectiveness were discussed in chapter two. In that chapter, we referred to Anthony's definition of effectiveness which is the extent to which actual output corresponds to the organization's goals and objectives. It is especially difficult to measure effectiveness in a service oriented or non-profit organization such as the Coast Guard.

Regarding output, the Coast Guard routinely meets the objective of carrying out one hundred percent of its CVS duties in the area of U.S. flag vessel inspections that are required by law. This output level does not include inspections of the courtesy or "spot check" type or the effects of routine time lags in scheduling a particular inspection. Given that actual output quantity is at or near one hundred percent of the expected amount, we should therefore be concerned with the quality of that output. It is the objective of the effectiveness model to measure inspection quality. In this process, Niskanen's recommended characteristics of an effectiveness measure should be

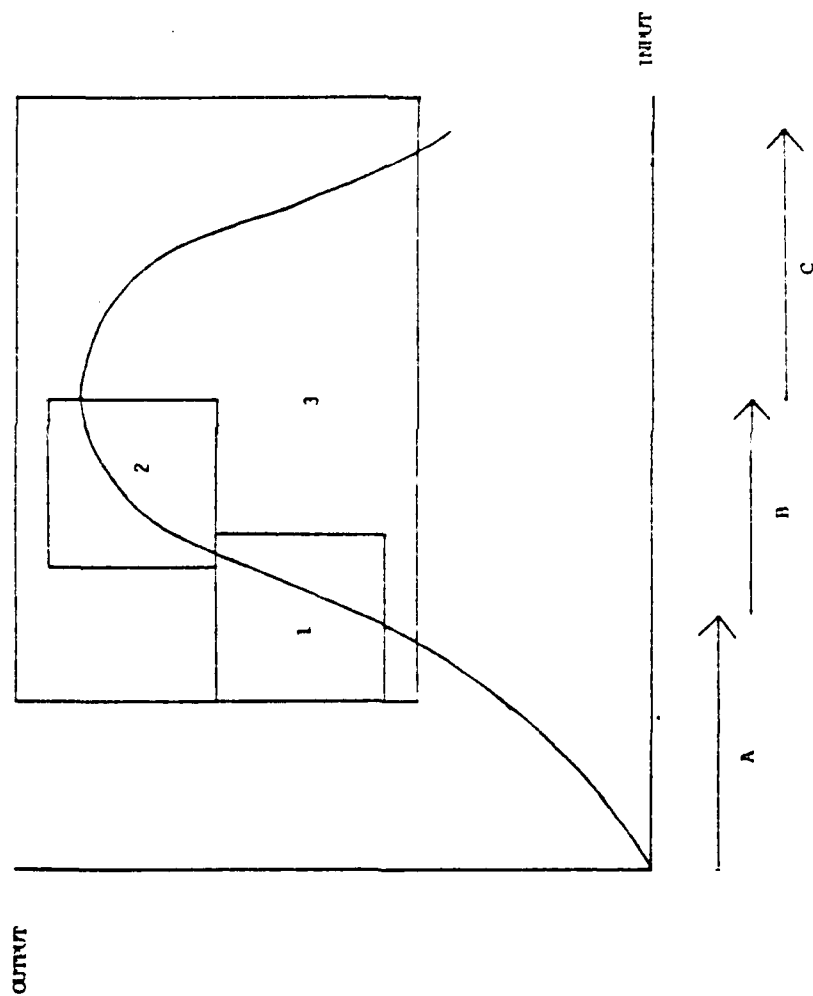


Figure V-1

remembered. He recommends that an effectiveness measure be both relevant and quantifiable. Objectivity is also desired in any measure that is employed.

Our method of measuring effectiveness involves the use of a mathematical model that is predicated on the economic law of diminishing returns. Any output requires the employment of some input. An example of the general relationship between input and output, which is often called the production function, is depicted in figure V-1. In this graph are three distinct conceptual relationships that exist between input and output. The first range, labelled A, corresponds to the theory of increasing returns to a variable input. The range labelled B, corresponds to a diminishing but positive return to a variable input and range C corresponds to a diminishing and negative return. When more than one input is involved, each usually has its own unique functional relationship within a relevant range. Not all curve forms will therefore look exactly alike.

We have chosen four input oriented factors that will be used in the effectiveness model. These factors are included for the following reasons: (1) We consider these factors to have a direct impact on the outcome being measured. (2) The necessary data is quantifiable, reasonably available and is objective in nature. The four factors are: (1) inspection manhours, (2) personnel rank, (3) the number of personnel involved in an inspection and (4) the number of formal

requirements issued at an inspection for outstanding deficiencies. These are called CG-835's. The effectiveness model (formula 1) is given below to indicate how these factors are applied. Three variations of this model are included (for a total of four formulas) so that the sensitivity of the relationship between alternatives can be evaluated. In formulas 2 and 4, the assigned weights for each factor are substituted with equal weights. In formulas 3 and 4, standard inspection manhours are used in the place of average manhours.

Effectiveness score =

$$\begin{aligned}
 &100 [W [\text{LN} (\text{ACTUAL MHRS.} / \text{AVERAGE MHRS.})] \\
 &+ X (\text{ACTUAL RANK} - \text{AVG. RANK}) \\
 &+ Y (\text{PERSONNEL SCORE}) \\
 &+ Z (\text{LOG}_{10} (\text{ACTUAL \# 835's ISSUED} / \text{AVG. \# 835's ISSUED}))] \\
 &+ 100
 \end{aligned}$$

Where $W+X+Y+Z=1$

Factors may have different individual relationships and thus be applied in different manners within a model because it would indeed be very difficult to conceive of such a precise orchestration of inputs that would result in uniform outcomes from a variance in each one. For example, if one desires to have a house painted, the effects of one painter versus two, of fifteen gallons of paint versus thirty, or of

twenty manhours of work versus forty, cannot all be the same on the desired outcome. Our estimation of the unique causal relationship portrayed by each of the factors was made with an application of the production function theory. Each factor's specific relationship with inspection quality was conceptualized and matched with a particular portion of the input/output curve within a predetermined relevant range. It is for this reason that the graph in figure V-1 is highlighted in the three areas labelled 1, 2 and 3.

Before discussing each factor, it should be pointed out that the overall design of the model is such that any inspection which equals the standard or average prerequisites will result in a score of one hundred. An above standard or average inspection results in a score above one hundred expressed as a percentage. A below standard or average inspection results in a percentage score below one hundred. It should also be remembered that the model is designed to measure quality only and not the efficiency within which the output is obtained from the inputs. Each factor is discussed in the order of their assumed importance.

1. Inspection Manhours

Actual inspection manhours for an individual inspection are compared to average manhours or the Coast Guard's standard manhours as a measure of inspection quality. This comparison involves the following assumptions. First, it is assumed that inspection quality varies with actual

manhours above or below the average or standard determined for that particular inspection. Average manhours are the arithmetic means derived from our sample of vessel inspection data. The data is listed in Appendix B. Coast Guard standard manhours were initially developed in 1972 from a collection of field unit data. The standards were updated during 1979-1980 through a Delphi survey taken among fifty field units due to vessel population and legislative changes. The standards were again modified in 1982 and are listed in the CVS operating program plan for fiscal years 1985-1994. Standard manhours have been determined by vessel type, (freighter, tanker, etc.) under several ranges of gross tonnage. The pertinent averages and standards are listed in table V-1. Second, it is assumed that the specific relationship between the ratio of actual to average or standard manhours and inspection quality resembles the natural log function. Under this assumption, manhours above average or standard result in higher quality that is subject to diminishing but positive returns. This functional relationship matches the portion of the curve in figure V-1 shown in box number two. When actual manhours equal the average or standard, the inspection is classified as standard by definition and a score of zero is obtained for this factor.

Table V-1
Average and Standard Inspection Manhours *

VESSEL TYPE AND SIZE	BIENNIAL		BIENNIAL & DRYDOCK	
	AVG	STD	AVG	STD
Cargo vessels less than 300 gross tons	18.17	10	31.83	16
Cargo vessels 300-19,999 gross tons	57.07	32	71.83	56
Cargo vessels of 20,000 gross tons and over	65.17	40	81.67	64
Tankships 1,000-19,999 gross tons	20.79	34	71.19	62
Tankships 20,000-39,999 gross tons	57.75	35	67.00	65
Tankships 40,000-74,999 gross tons	N/A	40	156.50	74
Tankships 75,000-124,999 gross tons	40.50	44	205.00	86
Mobile offshore drilling units	30.25	32	79.11	60
Liquified natural gas vessels	25.00	42	134.80	82

* Source of standard manhours: CVS Operating Program Plan, FY85-94

2. Personnel Rank

In the application of this factor, the average rank resulting from our data is used as a "standard" in comparison with actual rank. An average is used because a predetermined standard has not been documented for this purpose. Rank is used here as a crude measure of a person's experience and qualifications. Concerning inspection quality, it is assumed that the higher the rank, the better the quality within a relevant range. The particular relevant range is assumed to be rather narrow because most inspectors fall within the ranks of warrant and junior officers and are expected to an equivalent amount of basic training upon entering the program. The relatively few exceptions include chief petty officers and senior officers below flag rank. With this in mind, actual ranks have been quantified in numeric codes listed in table V-2. The codes were designed with a ten percent spread above and below the rank of W-4 warrant and O-3 lieutenant. This implies that a captain performs an inspection that is ten percent better than a lieutenant who, in turn, performs an inspection ten percent better than a chief. When more than one person is involved in an inspection, their average rank is used. The above assumption underlies our conceptualization of the relationship between rank and inspection quality. A change in rank above or below the standard is believed to have a linear effect on inspection quality.

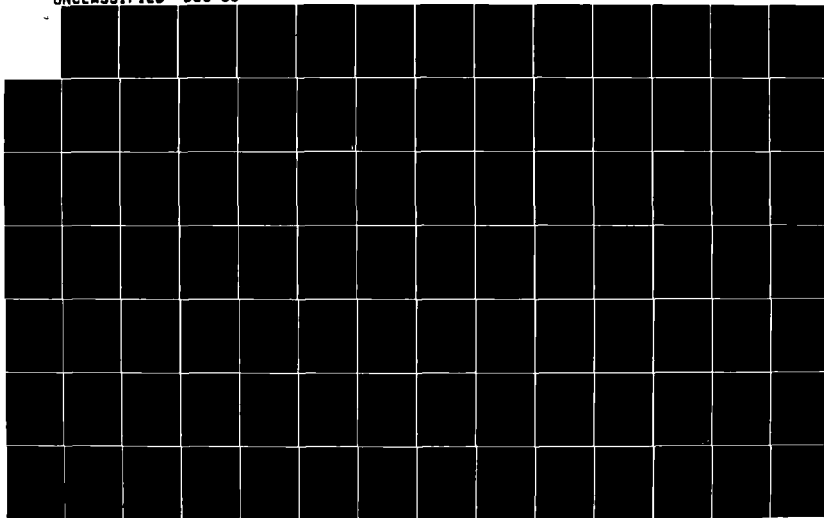
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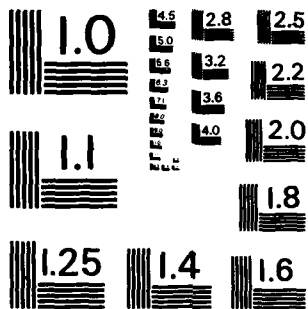
INSPECTION OF US FLAG VESSELS IN FOREIGN COUNTRIES AND
APPLICATION OF COST EFFECTIVENESS ANALYSIS(U) NAVAL
POSTGRADUATE SCHOOL MONTEREY CA W E ASHLEY ET AL.
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

This corresponds to the approximately linear portion of the curve in figure V-1 shown in box number one where constant returns to a variable input are realized.

Table V-2

Rank Codes

RANK	CODE	RANK	CODE
E-7	2.7	W-4	3.0
E-8		O-3	
E-9			
W-2	2.8	C-4	3.1
O-1			
W-3	2.9	C-5	3.2
O-2		C-6	3.3

3. Number of Personnel

Even though, in our data, the number of personnel involved in an inspection ranges from one to six, we assume the resulting range of effect of this input on quality to be relatively wide. In a very narrow range, usually one to three persons, inspection quality increases due to the additive effect of personal experience and expertise. Beyond a certain point, however, inspection quality would decline, even though there may be added benefits in the area of training unqualified persons. It is difficult to determine a point where diminishing and negative returns takes place due to an increase in the number of attending personnel.

Depending on the type of vessel, we have assigned various percentage scores which have been designed to quantify the relative effect a number of personnel are assumed to have on inspection quality. In this process, a score of zero signifies the "standard" and is used as a base in the determination of the other scores. We believe the inherent relationship between the number of persons and inspection quality includes both positive and negative incremental returns and therefore resembles the functional form of the curve in figure V-1 shown in box number three. The assigned personnel scores used in the model are listed in table V-3 by vessel type. Supply vessels are the equivalent of a freight vessel that is under 300 gross tons.

Table V-3
Personnel Scores

NUMBER OF PERSONS	VESSEL TYPE		
	FREIGHTER/TANKER	MODU*	SUPPLY
1	-.20	-.05	.00
2	.00	.10	.15
3	.20	.15	.10
4	.25	.05	.00
5	.10	-.10	-.15
6	-.05	-.30	-.40

* MODU stands for mobile offshore drilling unit.

4. Number of CG-835's Issued

In applying this factor, the actual number of CG-835's issued during a vessel inspection is compared to the average number obtained from the data. As with rank, an average is used because a predetermined standard is not available. Within the relevant range, we are assuming the relationship between CG-835's issued and inspection quality is similar to that of manhours in that the functional form resembles the log curve; referring again to box number two in figure V-1. The log base ten function is used instead of the natural log because we consider the effective range of this factor to be significantly smaller than that of manhours. The number of CG-835's issued above the average is considered an improvement in inspection quality, subject to diminishing positive returns. There are several underlying factors that influence the number of outstanding requirements issued. These include age of the vessel, location of vessel during an inspection (i.e. whether it is in a shipyard or near a source of repair or replacement items or not) and the style of a particular inspector. Considering the possible variability in these and other factors, we assume this factor's resulting effect to be less direct on inspection quality. We have therefore assigned it a relatively small weighting factor in the model.

5. Weighting Factors

The symbols w , x , y , and z are used in the model as multipliers of each of the four main factors so that they may be properly weighted. The magnitude of these multipliers corresponds to the relative importance we place on each of the factors within the model. In formula one, our basic model, and formula three, the weighting factors are: $w = .40$, $x = .30$, $y = .25$, and $z = .05$. In formulas number two and four, the weighting factors are equalized at $.25$.

B. DETERMINATION OF THE EFFECTIVENESS OF THE ALTERNATIVES

The effectiveness scores attributed to each of the ten fiscal quarters under consideration are listed in table V-4. These numerical scores were obtained by applying the mathematical effectiveness model and the three variations of the model to our inspection data sample. The data and the statistical package for the social sciences (SPSS) program used to process it are contained in appendix B. The best, worst and average scores for each of the two alternatives are also listed in the table under the respective time periods.

Table V-4

Effectiveness Scores

QTR	FORMULA:			
Alt. 2 (opened)	1	2	3	4
1-81	92.7	99.03	109.77	109.70
2-81	93.66	96.22	99.59	99.32
3-81	69.71	78.24	91.45	91.82
4-81	83.97	90.81	97.72	99.40
1-82	67.40	75.64	89.14	89.22
2-82	98.65	100.86	113.09	109.33
Best	98.65	100.86	113.09	109.33
Worst	67.40	75.64	89.14	89.22
Average	84.35	90.13	100.13	99.99
Alt. 1 (closed)				
3-82	110.52	99.28	123.90	107.64
4-82	112.67	93.39	99.47	100.98
1-83	102.38	99.54	111.93	105.50
2-83	93.45	94.66	107.03	103.15
Best	112.67	99.54	123.90	107.64
Worst	93.45	93.39	99.47	100.98
Average	104.75	96.72	110.58	104.32

VI. PROGRAM ASSESSMENT

Several factors in the area of overseas CVS activities will be discussed in this chapter. Even though they are indirectly related to the cost effectiveness analysis, the assessment may provide useful information and insights.

A. APPLICATION OF SPSS

Several programs were developed using the Statistical Package for the Social Science (SPSS) to analyze the data. SPSS is an integrated system of computer programs designed for the analysis of social science data. It allows a great deal of flexibility in the format of data. SPSS offers a comprehensive set of procedures for data transformation and file manipulation as well as a large number of statistical routines commonly used in the social science.

Frequencies, condenscriptive, scattergram, breakdown and regression procedures were used to analyze the data.

B. SOURCES AND DESCRIPTION OF DATA

The data for this study was collected in the two main categories of cost and effectiveness. The cost data was obtained from Coast Guard Headquarters (G-FAC) and the 14th C.G. District accounting division. These offices are responsible for processing the bills for recovery of travel and subsistence costs for the overseas CVS program. The cost

data is contained in two documents, Billing for Sale of Material or Services (CG-3621) and Travel Voucher or subvoucher (DD1351-2). The cost data is considered complete in that of the 925 bills issued during the time period studied, only one bill was not obtained. A copy of the documents and the raw data are contained in Appendix A.

The effectiveness data was collected from Coast Guard Marine Inspection Office, New York and Marine Safety Office, Honolulu. The data used in our effectiveness model were taken from completed CG-840 series inspection booklets. The vessels included in the population sampled were U.S. Flag, manned, oceangoing freightships over 100 gross tons, tankships over 1000 gross tons and Mobile Offshore Drilling Units (MODU). Vessels not included in the sample were Foreign Flag Vessels, uninspected vessels, vessels under major conversion, small passenger vessels, seagoing barges, inland or limited route vessels of any type, unmanned vessels of any type, integrated tug/barge configurations, tankships under 1000 gross tons, and freight/supply vessels under 100 gross tons, seagoing tugs, pilot boats, public vessels, ferrys, dredge barges and yachts.

The types of inspections included in the population sampled were Inspections for Certification (COI), done independently or in conjunction with a drydock exam (COI/DD). The types of inspections not included in the sample were major conversions, drydocks, repair, special inspections,

this purpose. The program is essentially a series of if statements which were designed to verify the proper format and range of variables and the consistency of variables being dependent on the values of other variables. The program was designed to check each data line independently and print a line of data if an error was detected in any one field. In running the program, twenty-one errors were detected and subsequently corrected. The program, titled Valprog Watfiv, is listed in Appendix D. The sample of inspection data used with our model to make measurements of effectiveness was validated manually. It was more practical to check the data in this manner because of its much smaller size in relation to the cost data. This data, and the SPSS program used to process it, are listed in Appendix B.

C. EVALUATION OF DATA

The data provides information about the amount and distribution of resources expended in carrying out the overseas inspection program. One important factor is the amount of manhours committed to the program in the 2-1/2 year period. The amount of actual manhours committed to the CVS program overseas is a measure of effort put forth by the Coast Guard. However the concept of evaluating the effort, or use of input and resources may or may not clearly indicate that the objectives of the programs are being met.

midperiods, partially completed inspections for certification and new construction inspections.

The above selection criteria were used in order to obtain a more homogeneous sample which would not be influenced by greater variability resulting from uncommon and special inspections.

The data was categorized by the variable names listed in table VI-1 and coded in accordance with table VI-2. The inspection data was assembled in 253 data lines.

During the entire 81 and 82 fiscal years and the first two quarters of 83, Coast Guard headquarters (GFCA) and 14th District (fca) accounting divisions issued 700 and 225 billing documents respectively. Several billing documents included billing for inspections performed in more than one time period or for several independent inspections. These were separated into a total of 1229 data lines. Inspections which covered more than one intervening month were apportioned equally during those intervening months. There were 662 travel claim data lines. The apportionment of billings and travel claims were implemented to give a more accurate account of travel and billings by time period. The cost data derived from overseas inspection billing documents and travel claims was assembled in a separate computer file. The data within this file was checked for correctness manually and with the aid of a fortran program written for

During the period under consideration approximately 239,670 manhours or .142 manyears were expended to the overseas inspection program. Of this total, 134.3 manyears or 94.6% was conducted by inspectors on temporary additional duty. Fiscal year manhour totals are provided in table VI-3. Because the Coast Guard lost 20 manyears due to travel, only 114.3 of the TAD manyears were actually available to conduct overseas inspections. Domestic offices had a mean loss rate of 15.3% while the overseas activities lost time to travel rate was 11.8%. The average length of an overseas trip increased 63% from 11.8 days in 1981 to 19.2 days in 1983. The length of the overseas trip in 1983 ranged from 14.6 hours to 76 days. Honolulu, a major participant which accounted for 30.8% of the allocated manhours in the first two quarters of 1983, had an average trip length of 35.1 days. The overseas offices prior to their closure accounted for 33.1% of the manhours devoted to the program. Table VI-4 lists the overseas offices contribution to the program. Based on manhours allocated in the first two quarters of each fiscal year there was a 27% increase in overseas inspection demand between 1981 and 1982 and a 15% increase between 1982 and 1983. There was a 23.8% increase between 1981 and 1982 based on the yearly allocated totals.

Table VI-1

Variables

Cost Variables:

Dist	_____	Coast Guard District or HQ unit
Yr	_____	Fiscal year of Inspection
Qtr	_____	Quarter and Fiscal Year of Inspection
Month	_____	Month and Calendar Year of Inspection
Rank	_____	Rank of Inspector
AMTB	_____	Amount billed to a particular company for a particular job
BDBD	_____	Difference between billing date and beginning date of inspection
BDCD	_____	Difference between billing date and completion date of inspection
MHAW	_____	Manhours available for work per overseas trip
MHLT	_____	Manhours lost to travel per overseas trip
MHTOT	_____	Total manhours per overseas trip

Effectiveness Variables:

TIMPD	_____	Category of data collection period
DATSO	_____	Office data was collected from (Source)
ITYPE	_____	Type of Inspection based upon office and inspection location
YRBLT	_____	Year vessel was built
GRTON	_____	Gross Tonnage of Vessel (Rounded)
VTYPE	_____	Type of vessel
ACTMH	_____	Actual manhours to perform inspection
STDMH	_____	Standard manhours projected to perform inspection
NU835	_____	Number of 835s issued
MONTH	_____	Month and Calendar Year inspection completed
YEAR	_____	Fiscal year inspection completed
NUISP	_____	Number of inspectors per inspection
STDCL	_____	Standard Class vessel inspection
INSCR	_____	Number of inspectors score

Table VI-2

Variable Codes

Month Codes:

Oct-10 Jan-01 Apr-04 Jul-07
 Nov-11 Feb-02 May-05 Aug-08
 Dec-12 Mar-03 Jun-06 Sep-09

Qtr. Code:

Oct-Nov-Dec --1
 Jan-Feb-Mar --2
 Apr-May-Jun --3
 Jul-Aug-Sep --4

District/Office Codes

1st District-(Boston) - 01	14th District-(Honolulu)- 14
2nd District-(St.Louis)-02	17th District-(Juneau)- 17
3rd District-(New York)-03	Headquarters - 30
5th District-(Norfolk) -05	Rotterdam - 31
7th District-(Miami) -07	Singapore - 32
8th District-(New Orleans)-08	Kobe - 33
9th District-(Cleveland) -09	Guam - 34
11th District-(LA/Long Beach)-11	Yokohama - 35
12th District-(San Francisco)-12	Ric Kojé - 36
13th District-(Seattle) -13	Ric Chiba - 37

Rank Codes:

Ens - 01	E-7 - 17	GS-11 - 11
LTjg - 02	E-8 - 18	GS-12 - 12
Lt - 03	E-9 - 19	GS-13 - 13
LCDR - 04	CWO2 - 22	
CDR - 05	CWO3 - 23	
CAPT - 06	CWO4 - 24	

TIMPD Codes:

Aug 79-Nov 80 — 1
 Dec 80-Mar 82 — 2
 Apr 82-Jul 83 — 3

Datso Codes:

New York — 3
 Honolulu — 4

Table VI-2 (cont)

ITYPE Codes:

Foreign Inspection/Foreign Personnel - 1
 Domestic Inspection/Domestic Personnel - 2
 Foreign Inspection/Domestic Personnel - 3

VTYPE Codes:

Supply Vessel - 1
 Freight ship - 2
 Tankship - 3
 Modu - 4
 Liquified natural gas carrier (LNG) - 5

Standard Class Code:

Vessel Type/Size	Inspection for Certification	Inspection for Certification (w) Drydock
Supply/freightship <300 gt	10	11
Freightship > 300-19,999 gt	20	21
Freightship > 20,000 gt	22	23
Tankship > 1000-19,999 gt	32	33
Tankship > 20,000-39,999 gt	34	35
Tankship > 40,000-74,999 gt	36	37
Tankship > 75,000-124,999 gt	38	39
MODU	40	41
LNG Vessels	50	51

Table VI-3

Allocation to Overseas Program

FY	TAD (MH)	TAD(2) (MY)	Projected(3) local (MH)	Projected local (MY)	Total (MH)	Total (MY)
81	70723.5	41.9	9582.4	5.7	80305.9	47.6
82	87520.5	51.8	3335.5	2.0	90856.0	53.8
83	68508.5	40.6	---	---	68508.5	40.6

(1) 83 comprised only of 1st and 2nd quarters

(2) Manhours / 1638 = manyears

(3) Standard amount of time spent while not on TAD

Table VI-4

Overseas Office Contributions

FY	TAD (MH)	TAD Local(2) (MY)	Local (MH)	Local (MY)	Total (MH)	Total (MY)	% Total	% of Total TAD
81	25865.7	15.3	9582.4	5.7	35448.1	21	44.1	36.5
82	17933.3	10.6	3335.5	2.0	21268.8	12.6	23.4	20.5
83	-----	-----	-----	---	-----	-----	-----	-----

(1) Overseas Activities closed in April 1982

(2) Standard amount of time spent while not on TAD

There is an apparent relationship between the length of an overseas trip and the availability ratio (MHAW/MHTOT). As trip length increases, this factor also increases up to a point of 21.9 days after which it levels off. This relationship is illustrated in the graph contained in Figure VI-1. The overall rating of 85.1% (Table VI-5) compares with the overseas activities rating of 88.2%.

In our sample of inspection data we found the actual manhours expended by inspectors an average of 160% greater than the standard manhours listed by the Coast Guard for the particular inspections (Table VI-6). There was also a significant decrease in the rank of the persons conducting the inspections over time. In 1981, 73.3% of the persons conducting the overseas inspections were Lieutenants (O-3) and above. However in 1983 only 48.9% of the inspectors fell in this range. The average time between the completion date of an inspection and the date the company gets billed has decreased from 181.8 days in 1981 to 160 days in 1983.

Finally, it was noted that the Far East was the area most visited by Coast Guard inspectors in carrying out the overseas inspection program. This area accounted for 54.6% or 626 overseas visits. See table VI-7 for a breakdown of visits by major geographic area. Additional tables and charts are contained in Appendix C.

Table VI-5

Availability Ratio (MHAW/MHTCT) By District Offices (1)

Dist/office	Mean	Dist/office	Mean
Boston -----	91.6	Honolulu -----	87.2
St Louis -----	93.4	Juneau -----	32.3
New York -----	83.6	Headquarters ----	83.0
Norfolk -----	89.3	Rotterdam -----	81.2
Miami -----	81.2	Singapore -----	66.1
New Orleans --	71.9	Kobe -----	91.1
Cleveland ----	84.7	Guam -----	32.8
LA/Long Beach -	86.5	Rio Kaje -----	94.3
San Francisco -	86.9	Rio Chiba -----	68.0
Seattle -----	75.3		

Entire Population -- 85.1

Figure VI-1

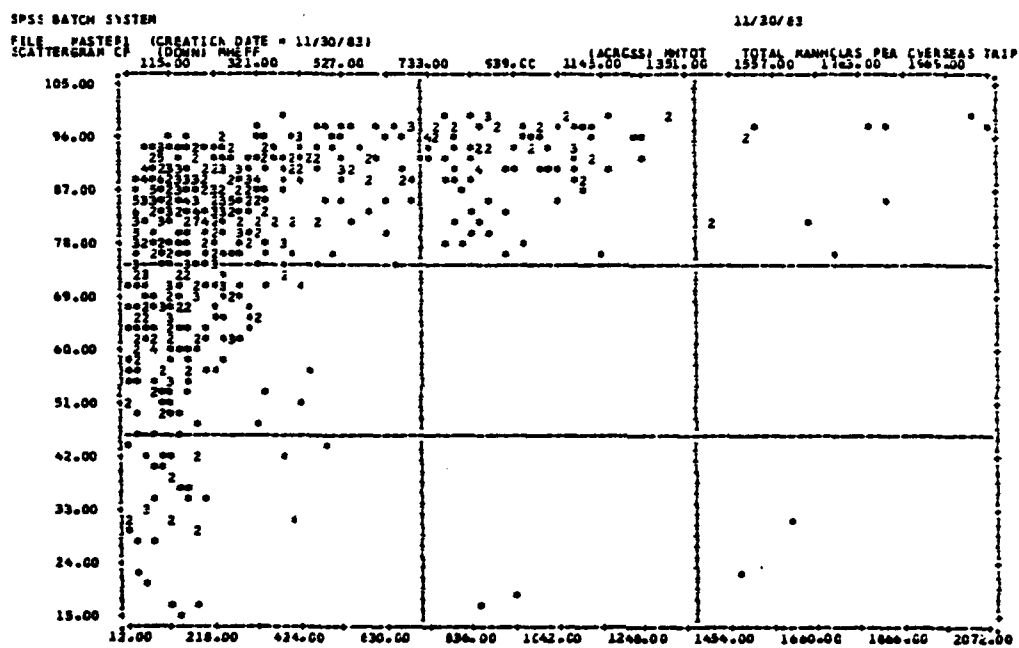


Table VI-6

Mean Actual Manhours as
Percentage of Standard Manhours

Cargo Vessels

Type of Inspection:	COI	COI/DD
< 300 gross tons	181.7% (18)	198.9% (46)
300-19,999 gross tons	178.3% (46)	128.3% (12)
20,000 gross tons	162.9% (12)	127.6% (3)

Tank Vessels

Type of Inspection:	COI	COI/DD
1000-19,999 gross tons	61.0% (12)	114% (8)
20,000-39,999 gross tons	165.0% (2)	103.1% (3)
40,000-74,999 gross tons	* (0)	211.5% (1)
75,000-124,999 gross tons	92.0% (1)	238.4% (1)

Mobile Offshore Drilling Units

Type of Inspection:	COI	COI/DD
	94.5% (8)	123.9% (9)

Liquified Natural Gas Carriers

Type of Inspection:	COI	COI/DD
	59.5% (1)	134.8% (5)

NOTE:

Number in parenthesis represents actual number of vessels in that particular category in sample population.

Table VI-7
Inspections Location

Area	Number of visits	% Total
Africa	34	7.3
Europe	196	17.3
Far East	626	54.6
North America	92	8.0
South America	94	8.2
Mideast	21	1.8
Others	33	2.9

Table VI-3
Mean Trip Length by Districts/Offices

Dist/Office	FY81 MTL (days)	FY82 MTL (days)	FY83 MTL (days)
Boston	13.3	13.9	6.3
St Louis	---	14.5	40.6
New York	8.8	12.0	16.4
Norfolk	20.8	36.4	32.1
Miami	8.8	12.8	42.7
New Orleans	10.6	9.6	8.5
Cleveland	4.8	---	26.7
LA/Long Beach	21.8	54.2	49.6
San Francisco	25.0	17.5	21.6
Seattle	33.1	16.4	13.9
Honolulu	3.8	28.9	35.1
Juneau	18.6	---	24.0
Headquarters	19.2	14.3	---
Rotterdam	4.9	6.8	---
Singapore	3.5	3.7	---
Kobe	9.0	13.6	---
Guam	---	3.5	---
Rio Koji	42.4	15.6	---
Rio Chiba	---	2.4	---
Entire Population	11.8	13.8	19.2

Table VI-9

TAD Manhours Allocated by Districts/Offices

Dist/Offices	FY 81	%	FY 82	%	FY 83*	%
Boston	6367.8	9.0	3343.4	3.8	2409.4	3.5
St Louis	-----	0.0	348.0	0.4	2925.0	4.3
New York	2739.6	3.9	12977.9	14.3	23170.2	33.8
Norfolk	3001.1	4.2	873.0	1.0	1539.8	2.2
Miami	2112.3	3.0	1534.4	1.7	1024.9	1.5
New Orleans	5077.2	7.2	12495.5	14.3	4092.5	6.0
Cleveland	230.5	0.3	-----	0.0	1283.5	1.9
LA/Long Beach	3666.5	5.2	3900.0	4.5	3573.0	5.2
San Francisco	14418.1	20.4	10919.1	12.5	2589.1	3.8
Seattle	1591.0	2.2	2754.5	3.1	3661.0	5.3
Honolulu	632.8	0.9	19408.9	12.5	21087.5	30.6
Juneau	1339.1	1.9	-----	0.0	1152.0	1.7
Headquarters	3681.9	5.2	1032.5	1.1	-----	---
Rotterdam	8331.0	11.8	4885.9	5.6	-----	---
Singapore	170.0	0.2	353.8	0.4	-----	---
Kobe	11260.0	15.9	9787.5	11.2	-----	---
Guam	-----	0.0	84.3	0.1	-----	---
Rio Koje	6104.6	8.6	2247.3	2.6	-----	---
Rio Chiba	-----	0.0	574.5	0.7	-----	---
Total	70723.5	99.9	87520.5	100	68508.5	100

* only first two quarters of 83 analyzed

Table VI-10
Comparison of Quarterly TAD Manhours

MIO New York:

Qtr	Total Manhours	% of Total	% Change
3-82	7281.6	44.7	2930.8
4-82	5062.6	17.3	-30.5
1-83	10519.0	28.3	107.0
2-83	12651.2	40.5	20.3

MSC Honolulu:

Qtr	Total Manhours	% of Total	% Change
3-82	2491.1	15.3	-42.3
4-82	10012.8	34.2	302.0
1-83	11796.1	31.7	17.8
2-83	9291.5	29.7	-21.2

Table VI-10 shows the recent quarterly TAD manhours expended by the two major offices participating in overseas CVS inspections. While there are significant fluctuations in the quarterly amounts for both offices, the fluctuations are greater under MIO New York. Fluctuations in demand within a period of one year to the extent indicated in this table pose scheduling and planning problems and make it difficult to project necessary force levels at these units.

VII. EVALUATION OF ALTERNATIVES

A. EVALUATION OF QUANTIFIED FACTORS

The ratios of cost to effectiveness for each alternative; under their respective fiscal quarters and for the effectiveness model and each of the three variations included; are listed in table VII-1. The quarterly operating costs are taken from table IV-9. The effectiveness scores are taken from table V-4. In evaluating these ratios, it should be noted that numbers of smaller magnitude are desired. Referring to the table, the ratios attributable to alternative one are clearly superior to those attributable to alternative two. The best, worst and average scores obtained from each of the four formulas indicate a consistent improvement in score when the overseas offices are closed. This is true even when the unusually low values for quarter 382 are excluded.

In comparing the results of the formulas listed in table VII-1, there is a general increase in effectiveness scores and a resulting decrease in the ratios under formulas 3 and 4 where actual manhours are compared to standard rather than average manhours. This is due to the fact that standard manhours were found to be consistently lower than average manhours for similar types of inspections within the sample.

Table VII-1

Cost Effectiveness Ratios

Qtr:	Effectiveness Formula:			
Alt 2	1	2	3	4
1-81	1546	1447	1306	1307
2-81	1760	1714	1656	1650
3-81	2669	2378	2035	2026
4-81	2252	2083	1935	1903
1-82	2375	2117	1796	1795
2-82	1715	1677	1496	1540
Best	1546	1447	1306	1307
Worst	2669	2378	2035	2026
Average	2053	1903	1704	1704
Alt 1				
3-82	424	472	379	436
4-82	929	1121	1053	1037
1-83	1051	1081	962	1020
2-83	1097	1063	958	994
Best	424	472	379	436
Worst	1097	1121	1053	1037
Average	875	939	838	872

The use of equal weighting factors in formulas 2 and 4, instead of the assigned weights, also had the effect of increasing effectiveness scores, although to a lesser degree. The use of equal weighting factors in the model also decreased the variability resulting from a decrease in the weight assigned to actual manhours which was found to generate most of the variability in scores.

There are improvements in the effectiveness scores in most cases under alternative number one. The effectiveness scores for alternative one are equal to or greater than 95 in three of the four quarters measured using the basic model, and the average score of the four quarters is above 100. A score of 95 or above is assumed to be within acceptable limits. The effectiveness scores for alternative one are equal to or greater than 95 in 13 of the 16 cases measured when including the three variations of the model. This is compared to a number of 12 out of 24 cases under alternative two having a score of 95 or better.

The comparison of quantified cost and effectiveness factors therefore leads one to conclude that the overseas CVS offices should remain closed. There is, however, one factor which should be considered in the evaluation of effectiveness scores. When the overseas offices were open during fiscal 1981 and the first half of fiscal 1982, the portion of overseas TAD inspections carried out by foreign based personnel was about one third of the total performed. This

average is based on the amounts of TAD manhours available for work (MHAW) expended by personnel attached to U.S. and foreign offices during that period. The effectiveness scores for each quarter were therefore weighted in favor of the scores attributable to inspections conducted by U.S. based personnel in accordance with the mix of inspections performed during each quarter. Even though most of the manhours allotted to the foreign based personnel were spent on TAD inspections, their portion of the total inspections averaged one third of the total. This means that the closure of the overseas offices had a relatively minor effect on the overall method of conducting overseas CVS activities. This also means that the effectiveness model essentially measured the quality of overseas inspections conducted by U.S. based personnel under both alternatives. As a result, the recent improvements in effectiveness scores may be more appropriately attributed to a general improvement in the quality of inspections rather than to the closure of the overseas offices. This factor also leads to the conclusion that the level of personnel stationed overseas would have to be greatly increased if the offices were to be reopened and if they were to be expected to accomplish a more substantial portion of the workload. In closing, we feel it is important to note that there were some substantial differences in effectiveness scores obtained under alternative two between

inspections conducted by U.S. and foreign based personnel. In quarters 3-91 and 1-92 the scores for inspections conducted by foreign based personnel were 100.2 and 92.11 respectively. The scores for inspections conducted by U.S. based personnel for the same quarters and using formula one were 56.32 and 52.25 respectively, a decrease of over 40%. There was also one quarter where a score of 100 for inspections performed by U.S. based personnel was almost 15% better than that of inspections by foreign based personnel.

B. ASSESSMENT OF NON-QUANTIFIABLE FACTORS

As discussed in chapter two, quantifiable factors tend to take precedence over non-quantifiable factors. Decisions are sometimes based on insignificant factors that can be measured with precision, while the crucial unmeasurables are neglected. It is the purpose of this section to address some of the non-quantifiable issues that have an impact on the cost-effectiveness of overseas inspection alternatives.

Information gathered by headquarters planning personnel from several major inspection/safety offices highlighted several key areas:

- 1) Personal Safety - Safety and security are day by day watchwords. Respect for human life, especially in the Far East, is considerably less than in Western nations. No formal procedures are currently in place to handle medical emergencies for TAD inspectors.

2) Logistics - The workplace for the inspectors is as diverse as can be imagined. Each area has its own language, culture, standard of living, transportation and communication problems. The "Fly American Policy" increases the complexity of scheduling and increases the lost time due to travel.

3) Language and Culture Differences - Inspectors experience numerous problems due to unfamiliarity with laws of country as well as customs. Several countries do not allow unaccompanied women. This is a sensitive issue that reduces the options available to office managers and creates inequitable distribution of assignments in offices with female inspectors.

4) Personal Financial Burden - There is a problem in drawing sufficient amounts of advance for travel and per diem. The maximum limits vary from \$250 to \$500. Our data indicated that the mean amounts billed are substantially higher than these limits. It is considered that per diem rates are sufficient in the large cities where higher rates have been established. In the towns near the shipyards rates have often not been established so the minimum rate of \$50 a day is in effect. This is usually insufficient to cover expenses.

The above issues, coupled with longer durations of overseas trips and erratic separation in some instances from dependents, are likely to have an adverse effect on morale.

During August of 1983, a total of 43 letters were sent to various maritime organizations which were found to have a number of recurring overseas inspections. The letters were designed to solicit narrative remarks in several broad areas concerning effects on operations resulting from the recent delegation of authority to the American Bureau of Shipping, and the closure of the overseas CVS offices. A total of 12 companies responded to our letter. Of the 12, four are involved in the operation of offshore supply vessels, five own or operate mobile offshore drilling units and three own or operate freightships or tankships engaged in overseas shipping.

While all of the respondents indicated that the closure of the overseas offices did not have an effect on the amount of periodic inspections requested overseas, there were some misgivings concerning the recent changes. In our discussion of the responses, several comments made by responding companies will be quoted. The type of company will be described, but we feel the identity of a company need not be disclosed.

The respondents which own or operate offshore supply vessels identified the cost of the reimbursements made to the Coast Guard for overseas inspections as an economic hardship. One company remarked: "The main disadvantages we have discovered since the closing of the U.S.C.G. overseas offices, have been economic in nature, with the high cost of

travel, per diem and related expenses topping the list."

Another company referred to problems involving costs and inspector consistency.

"Obviously the closure has had an adverse financial impact and has created problems that affect our satisfaction with inspection functions. One significant problem has been in inspector consistency. Many offices have had to draw inspectors from wherever they could find them. A number of these individuals were inexperienced and not adequately prepared to operate alone in a remote location. This indicated to us that the Coast Guard was operating in an overload condition."

One of the five respondents which own or operate mobile offshore drilling units cited problems in scheduling for TAD inspectors while the other four reported no significant delays or problems in this area. Two of the five companies identified problems involving the competency of travelling inspectors. One of these companies remarked that their level of satisfaction had decreased since the closure of the overseas offices. "...the overseas offices, particularly Rotterdam and Singapore, were staffed with personnel experienced in the offshore drilling industry. They understood the vast differences between a drilling rig and a ship. They were also familiar with problems particular to overseas operations." A second company stated: "There seems to be fewer competent inspectors, and the inspectors that are available are generally stretched so thin they cannot devote the time necessary for each vessel." This company also pointed out that communications between an inspector and his home office, which are sometimes needed to resolve problems

or disputes, are adversely affected by the long distances travelled. They recommended that the Coast Guard should reopen the foreign offices or delegate more functional authority to the American Bureau of Shipping or other agencies that are more available overseas. A third company replied that continuity in foreign shipyards is now practically nonexistent. It is interesting to note that companies involved in the operation of offshore supply vessels were concerned with the costs of inspections, while companies involved in the operation of mobile offshore drilling units were more concerned with the competency of the inspectors.

Another problem pointed out by several of the respondents involved the nonavailability of inspectors for special inspections to correct prior deficiencies or for shop inspections of approved safety or life-saving equipment overseas. One company made the following comments in this area:

"Liferaft servicing/inspections are a major problem in some areas. Since we cannot afford to shuttle Coast Guard personnel around the world, we have tried to use the approved third party inspection procedure. However, many of the areas in which we operate do not have U.S.C.G. approved facilities. We are, therefore faced with the choice of keeping rafts onboard past the inspection date or shipping them out of the country which takes from 3 to 6 months. As regards outstanding deficiencies, the item would have to be extremely grave to warrant the cost of a second inspection trip. We try to assure the cognizant OCMI via written confirmation of compliance. To date, we have received a fair response to this procedure."

The responses generally indicated that from the perspective of these companies, several problem areas have arisen as a result of the closure of the overseas offices. Problem areas include such factors as scheduling, availability of inspectors, the competency of TAD inspectors, communications and the continuity of enforcement policies. These same problem areas have concerned CVS program managers. It is, of course, not known whether the perceptions of those companies who did not respond, and others, would substantiate the comments received or not.

C. PENDING LEGISLATION

There are several bills before Congress that if enacted will have significant impact upon overseas inspection activities. One of these bills is the Merchant Marine Act of 1983, an administration bill, to amend the Merchant Marine Act of 1936 to extend to U.S. flagship operators authority to construct, reconstruct, or acquire ships outside the U.S. without forfeit of eligibility for operating differential subsidies. If implemented it will most likely increase the manhours allocated to overseas inspections. Charles I. Hiltzheimer, Chairman and Chief Executive Officer, of Sea-Land Industries Investment Inc., during congressional testimony, suggested a revision to the act that would permit non-subsidized U.S. flag operators to use tax deferred capital construction funds for acquisition of foreign-built

vessels. This revision would tend to increase the size of the U.S. fleet.

Finally, implementation of the Cargo Preference Act would require Federal agencies engaged in commodity export and import by ship to transport at least 50% of cargoes by U.S. flag vessels. The short term impact of this bill is dependent upon the utilization of existing capacity. The long term impact would be an increase in workload concerning periodic inspections of the U.S. fleet.

D. RECOMMENDATIONS

The following recommendations are offered as a result of this analysis:

1. That further research be conducted in the area of estimating, measuring and evaluating the effectiveness of CVS activities. This includes the formulation of relevant effectiveness models or measures such as the one used in this analysis and the design of proper procedures to validate them. Contrary to the views expressed in the CVS Operating Program Plan for fiscal years 85-94 that there are no accurate quantitative measures of effectiveness; and that effectiveness must be inferred from changes in accident rates; we feel that workable methods of measuring effectiveness can be devised that are not necessarily predicated on safety records.

2. The Coast Guard should formulate a strategy, goals and objectives that are more specifically tailored to overseas CVS activities. In this effort, a projection of future demands for our services, the impacts of pending legislation and the desires of internal decision-makers and our constituents should be considered. Costs resulting from travel time and billing delays are to a great extent dependent upon overseas workload. Substantial increases in future workloads due to changes in the legal or economic environment could result in significant increases in these costs and, therefore, increase the desirability of reopening some level of overseas facilities.

3. In the event that the overseas offices are reopened, alternative methods of recovering operating expenses incurred should be explored. An equitable means of allocating office operating expenses to the parties that more directly benefit from their services would be an area of concern.

4. The Coast Guard should evaluate whether or not it would be beneficial to provide some level of language training for CVS personnel. This training could be designed to acquaint an inspector with some of the basic language and cultural differences and better prepare these personnel for situations involving medical and other emergencies.

5. The policies concerning limits on the amounts of advance funds which may be drawn by inspectors should be reevaluated. Essentially, this would involve an effort to remove financial

burdens which in some cases are placed on personnel in situations involving especially long trips or trips to high cost areas. Appropriate policies in this area are increasingly important because both the number and length of overseas trips have increased since 1981.

APPENDIX A: COST AND MANHOURLY DATA AND COMPUTER PROGRAM

FILE: MASTER2 SPSS

APPENDIX A

FILE NAME MASTER1
 VARIABLE LIST DIST,YR,CTR,PCNT,RANK,AMTB,CUMA,BDBC,BOCD,
 MMAM,MHMT,MHCT,CMB
 INPUT FORMAT FIXED (F2,0,2X,F2,0,2X,F3,0,2X,F4,0,2X,F2,0,2X,F8,2,1X,
 F1,0,1X,F3,0,1X,F3,0,2X,F7,2,2X,F7,2,2X,F7,2,2X,F1,0)
 A CF CASES 1283
 INPUT METHOD CARD
 VAR LABELS DIST,COAST GUARD DISTRICT/
 YR,FISCAL YEAR OF INSPECTION/
 CTR,QUARTER AND FISCAL YEAR/
 MONTH,MONTH AND YEAR OF INSPECTION/
 RANK,RANK OF INSPECTOR/
 AMTB,AMOUNT BILLED/
 CUMA,DUMMY VARIABLE ONE/
 BDBC,BILLING DATE BEGINNING DATE/
 BOCD,BILLING DATE COMPLETION DATE/
 PHAS,MANHOURS AVAILABLE FOR CRK/
 MHT,MANHOURS LEFT TO TRAVEL/
 MHTOT,TOTAL MANHOURS PER OVERSEAS TRIP/
 CUMB,DUMMY VARIABLE TWO/

READ	INPUT DATA	DIST	YR	CTR	PCNT	RANK	AMTB	CUMA	BDBC	BOCD	MMAM	MHMT	MHCT	CMB
1	1080	03	71	2	76	1	125	121	84.50	25.25	10	5.75	2	
2	1080	03	257	3	33	1	134	116	168.00	24.00	10	5.00	2	
3	1080	03	305	3	90	1	116	105	161.00	44.00	2	0.00	2	
4	1080	03	173	3	86	1	112	105	78.50	10.00	1	0.00	1	
5	1080	03	173	3	56	1	104	100	144.20	10.00	1	0.00	1	
6	1080	03	153	3	33	1	100	094	000.00	000.00	0	0.00	0	
7	1080	03	157	3	26	1	103	102	22.00	16.00	1	0.00	1	
8	1080	03	82	3	73	1	103	096	119.00	32.00	1	0.00	1	
9	1080	03	76	3	30	1	092	087	109.25	24.75	1	0.00	1	
10	1080	03	253	3	79	1	105	101	94.50	37.00	1	0.00	1	
11	1080	03	5	3	13	1	067	087	6.25	7.00	1	0.00	1	
12	1080	03	6	3	2	1	084	083	26.50	6.00	1	0.00	1	
13	1080	03	281	3	18	1	095	086	159.75	44.00	2	0.00	2	
14	1080	03	207	3	73	1	091	085	114.70	32.50	1	0.00	1	
15	1080	03	53	3	49	1	142	142	7.00	5.75	1	0.00	1	
16	1080	03	77	3	08	1	141	137	82.75	17.95	1	0.00	1	
17	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
18	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
19	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
20	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
21	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
22	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
23	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
24	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
25	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
26	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
27	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
28	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
29	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
30	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
31	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
32	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
33	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
34	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
35	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
36	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
37	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
38	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
39	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
40	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
41	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
42	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
43	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
44	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
45	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
46	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
47	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
48	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
49	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
50	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
51	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
52	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
53	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
54	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
55	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
56	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
57	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
58	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
59	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
60	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
61	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
62	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
63	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
64	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
65	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
66	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
67	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
68	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
69	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
70	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
71	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
72	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
73	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
74	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
75	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
76	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
77	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
78	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
79	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
80	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
81	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
82	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
83	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
84	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
85	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
86	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
87	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
88	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
89	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
90	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
91	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
92	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
93	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
94	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
95	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
96	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
97	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
98	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
99	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
100	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
101	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
102	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
103	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
104	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
105	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	
106	1080	03	11	3	00	1	140	138	55.50	7.00	1	0.00	1	

A NAVAL POSTGRADUATE SCHOOL

132

A NAVAL POSTGRADUATE SCHOOL

135

A NAVAL POSTGRADUATE SCHOOL

136

139

A NAVAL POSTGRADUATE SCHOOL

141

[illegible]

A NAVAL POSTGRADUATE SCHOOL

[illegible]

FILE: MASTER2 SPSS A NAVAL POSTGRADUATE SCHOOL

```

CPTICNS
STATISTICS
*SELECT IF
*SELECT IF
SCATTERGRAM
CPTICNS
STATISTICS
*SELECT IF
*SELECT IF
SCATTERGRAM
CPTICNS
STATISTICS
*SELECT IF
*SELECT IF
SCATTERGRAM
CPTICNS
STATISTICS
*SELECT IF
CONDESCRIPTIVE
CPTICNS
STATISTICS
*SELECT IF
SCATTERGRAM
CPTICNS
STATISTICS
*SELECT IF
SCATTERGRAM
CPTICNS
STATISTICS
*IF
*IF
*IF
*SELECT IF
*SELECT IF
BREAKDOWN
CPTICNS
STATISTICS
*IF
*IF
*IF
*SELECT IF
*SELECT IF
BREAKDOWN
CPTICNS
STATISTICS
*IF
*IF
*IF
*SELECT IF
*SELECT IF
*COMPUTE
BREAKDOWN
CPTICNS
STATISTICS
*IF
*IF
*IF
*SELECT IF
*SELECT IF
*COMPUTE
SCATTERGRAM
CPTICNS
STATISTICS

```

FILE: MASTER2 SPSS A NAVAL POSTGRADUATE SCHOOL

```

*IF (YR EQ 81) FLAG = 1
*IF (YR EQ 82) FLAG = 1
*IF (YR EQ 83) FLAG = 1
*SELECT IF (FLAG EQ 1)
*SELECT IF (DUMB EQ 2)
*COMPUTE MHEFF = (MHAH/MHTCT) * 100
SCATTERGRAM MHEFF WITH MHTOT
CPTIONS 1,7,8
STATISTICS ALL
*IF (YR EQ 81) FLAG = 1
*IF (YR EQ 82) FLAG = 1
*IF (YR EQ 83) FLAG = 1
*SELECT IF (FLAG EQ 1)
*SELECT IF (DUMB EQ 2)
*COMPUTE MHEFF = MHAH/MHTCT
BREAKDOWN TABLES = MHEFF BY YR/MHEFF BY QTR/MHEFF BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 17)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*22100
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 18)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*25000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 19)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*28000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 22)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*24000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 23)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*28000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 24)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*33000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 01)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*17400
BREAKDOWN TABLES = LTTC BY QTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 02)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHT/168E)*24000
BREAKDOWN TABLES = LTTC BY QTR BY DIST/

```

FILE: MASTER2 SPSS A NAVAL POSTGRADUATE SCHOOL

```

CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ C3)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*29300
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 04)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*35C00
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 05)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*41300
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 06)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*49800
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 11)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*22E00
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 12)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*24551
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 81)
*SELECT IF (RANK EQ 13)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*32200
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 17)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*26600
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 18)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*30100
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 19)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*34500
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL

```

FILE: MASTER2 SPSS A NAVAL POSTGRADUATE SCHOOL

```

*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 22)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*27700
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 23)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*32200
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 24)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*38100
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 01)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*20100
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 02)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*27700
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 03)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*33900
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 04)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*40600
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 05)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*47900
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 06)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*57700
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 11)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (MHLT/168E)*23900
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 12)

```

FILE: MASTER2 SPSS A NAVAL POSTGRADUATE SCHOOL

```

*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*28245
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 13)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*33800
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 17)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*27600
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 82)
*SELECT IF (RANK EQ 18)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*31500
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 19)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*34100
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 22)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*29000
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 23)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*33800
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 24)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*40000
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 01)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*21100
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 02)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*29000
BREAKDOWN TABLES = LTTC BY CTR BY DIST/
CPTIONS 1
STATISTICS ALL
*SELECT IF (YR EQ 83)
*SELECT IF (RANK EQ 03)
*SELECT IF (DUMB EQ 2)
*COMPUTE LTTC = (PHLT/168E)*35600

```

A

A

APPENDIX B: EFFECTIVENESS DATA AND COMPUTER PROGRAM

FILE: DATAEFF SPSS APPENDIX B

FILE NAME INSDAT1
VARIABLE LIST TIMPD, DATSO, ITYPE, YRBLT, GRTON, VTYPE, ACTMH,
SDTMH, ACTRK, NUB33, MONTH, QTR, YEAR, NUISP, STDCL, INSCR,
INPUT FORMAT FIXED (F1.0,1X,F1.0,1X,F1.0,1X,F2.0,1X,F6.0,1X,F1.0,
1X,F6.2,
1X,F5.2,1X,F4.2,1X,F2.0,1X,F4.0,1X,F3.0,1X,F2.0,1X,
F1.0,1X,F2.0,1X,F4.2)
N OF CASES 244
INPUT MEDIUM CARD
VAR LABELS TIMPD, CATERGORY OF DATA COLLECTION PERIOD/
DATSO, DATA SOURCE 3=NEW YORK 4=HONOLULU/
ITYPE, INSPECTION TYPE 1=FF 2=DD 3=FC/
YRBLT, YEAR VESSEL BUILT/
GRTON, GROSS TONNAGE OF VESSEL IN WHOLE INCREMENTS/
VTYPE, TYPE OF VESSEL 1=SUP 2=FRT 3=TNK 4=MOGL 5=LANG/
ACTMH, ACTUAL MANHOURS TO PERFORM THE INSPECTION/
SDTMH, STANDARD MANHOURS PROJECTED TO PERFORM INSP/
ACTRK, AVERAGE RANK OF INSPECTORS PER INSPECTION/
NUB33, NUMBER OF ISSUES ISSUED/
MONTH, MONTH AND CALENDAR YEAR INSPECTION COMP/
QTR, QUARTER AND FISCAL YEAR INSPECTION COMP/
YEAR, FISCAL YEAR INSPECTION COMPLETED/
NUISP, NUMBER OF INSPECTORS PER INSPECTION/
STDCL, STANDARD CLASS OF VESSEL/
INSCR, NUMBER OF INSPECTORS SCORE/

READ	INPUT	DATSO	ITYPE	YRBLT	GRTON	VTYPE	ACTMH	SDTMH	ACTRK	NUB33	MONTH	QTR	YEAR	NUISP	STDCL	INSCR
1	1	76	1	55	16	00	01	12	79	180	80	1	11	1	11	00
1	1	73	1	68	16	00	01	07	80	480	80	1	11	1	11	00
1	1	45	1	104	56	00	01	04	60	380	80	1	11	1	11	00
1	1	70	1	51	10	00	01	05	79	479	79	1	11	1	11	00
1	1	77	1	60	65	00	01	12	79	180	80	1	11	1	11	00
1	1	77	1	94	62	00	01	09	80	480	80	1	11	1	11	00
1	1	72	1	156	74	00	01	11	80	181	81	2	37	1	11	00
1	1	74	1	24	32	00	01	07	05	80	80	1	11	1	11	00
1	1	74	1	72	16	00	01	05	79	479	79	1	11	1	11	00
1	1	74	1	72	16	00	01	05	80	240	80	1	11	1	11	00
1	1	45	1	37	56	00	01	03	80	240	80	1	11	1	11	00
1	1	45	1	23	56	00	01	05	80	280	80	1	11	1	11	00
1	1	45	1	85	56	00	01	05	80	480	80	1	11	1	11	00
1	1	73	1	24	32	00	01	07	05	80	80	1	11	1	11	00
1	1	73	1	24	32	00	01	07	05	80	80	1	11	1	11	00
1	1	73	1	13	16	00	01	07	05	80	80	1	11	1	11	00
1	1	73	1	18	16	00	01	07	05	80	80	1	11	1	11	00
1	1	74	1	101	16	00	01	07	05	80	80	1	11	1	11	00
1	1	74	1	35	16	00	01	07	05	80	80	1	11	1	11	00
1	1	74	1	4	16	00	01	07	05	80	80	1	11	1	11	00
1	1	74	1	62	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	14	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	33	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	46	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	55	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	17	16	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	37	16	00	01	07	05	80	80	1	11	1	11	00
1	1	76	1	102	16	00	01	07	05	80	80	1	11	1	11	00
1	1	76	1	58	16	00	01	07	05	80	80	1	11	1	11	00
1	1	75	1	197	16	00	01	07	05	80	80	1	11	1	11	00
1	1	75	1	23	16	00	01	07	05	80	80	1	11	1	11	00
1	1	75	1	44	16	00	01	07	05	80	80	1	11	1	11	00
1	1	75	1	22	16	00	01	07	05	80	80	1	11	1	11	00
1	1	75	1	81	33	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	44	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	91	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	17	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	25	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	7	10	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	44	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	52	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	28	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	48	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	85	32	00	01	07	05	80	80	1	11	1	11	00
1	1	77	1	38	32	00	01	07	05	80	80	1	11	1	11	00

FILE: DATAEFF SPSS A NAVAL POSTGRADUATE SCHOOL

```

*IF (ITYPER C 1) FLAG3 =3
*IF (ITYPER C 3) FLAG3 =3
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
CONDESCRPTIVE ACTRK, NUS35, ACTMH, STDMH, NLISP, INSCR
OPTICNS 1,4
STATISTICS ALL
*IF (YEAR C 81) FLAG =1
*IF (YEAR C 82) FLAG =1
*IF (YEAR C 83) FLAG =1
*SELECT IF (FLAG C 1)
*COMPUTE PCTSTO = ACTMH/STDMH * 100
BREAKDOWN TABLES = PCTSTO BY QTR/PCTSTO BY YEAR/
PCTSTO BY ITYPE/PCTSTO BY VTYPE/
PCTSTO BY DATSO/PCTSTO BY ACTRK/
PCTSTO BY TIMPD/PCTSTO BY STDC/

OPTICNS 1
STATISTICS ALL
*IF (YEAR C 81) FLAG =1
*IF (YEAR C 82) FLAG =1
*IF (YEAR C 83) FLAG =1
*IF (VTYPE C 1) FLAG2 =2
*IF (VTYPE C 2) FLAG2 =2
*IF (VTYPE C 3) FLAG2 =2
*IF (VTYPE C 4) FLAG2 =2
*IF (ITYPER C 1) FLAG3 =3
*IF (ITYPER C 2) FLAG3 =3
*IF (ITYPER C 3) FLAG3 =3
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
*COMPUTE PCTSTO = ACTMH/STDMH * 100
BREAKDOWN TABLES = PCTSTO BY QTR/PCTSTO BY YEAR/
PCTSTO BY ITYPE/PCTSTO BY VTYPE/
PCTSTO BY DATSO/PCTSTO BY ACTRK/
PCTSTO BY TIMPD/PCTSTO BY STDC/

OPTICNS 1
STATISTICS ALL
*IF (STDC C 10) AVGMH = 13.1067
*IF (STDC C 11) AVGMH = 13.0268
*IF (STDC C 12) AVGMH = 13.0659
*IF (STDC C 13) AVGMH = 13.0334
*IF (STDC C 14) AVGMH = 13.1067
*IF (STDC C 15) AVGMH = 13.0667
*IF (STDC C 16) AVGMH = 13.0791
*IF (STDC C 17) AVGMH = 13.1879
*IF (STDC C 18) AVGMH = 13.1500
*IF (STDC C 19) AVGMH = 13.0000
*IF (STDC C 20) AVGMH = 13.0000
*IF (STDC C 21) AVGMH = 13.0000
*IF (STDC C 22) AVGMH = 13.0000
*IF (STDC C 23) AVGMH = 13.0000
*IF (STDC C 24) AVGMH = 13.0000
*IF (STDC C 25) AVGMH = 13.0000
*IF (STDC C 26) AVGMH = 13.0000
*IF (STDC C 27) AVGMH = 13.0000
*IF (STDC C 28) AVGMH = 13.0000
*IF (STDC C 29) AVGMH = 13.0000
*IF (STDC C 30) AVGMH = 13.0000
*IF (YEAR C 81) FLAG =1
*IF (YEAR C 82) FLAG =1
*IF (YEAR C 83) FLAG =1
*IF (VTYPE C 1) FLAG2 =2
*IF (VTYPE C 2) FLAG2 =2
*IF (VTYPE C 3) FLAG2 =2
*IF (VTYPE C 4) FLAG2 =2
*IF (ITYPER C 1) FLAG3 =3
*IF (ITYPER C 3) FLAG3 =3
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
*SELECT IF (FLAG3 C 3)
*COMPUTE EFF = (.40*(LN(ACTMH/AVGMH)) + .30*(ACTRK-2.586)
+ .25*(INSCR) + .05*(LG10(NUS35/5.932))) * 100
BREAKDOWN TABLES = EFF BY QTR/EFF BY QTR BY ITYPE/
EFF BY ITYPE/EFF BY YEAR/EFF BY QTR BY VTYPE/
EFF BY YEAR BY VTYPE/

```


FILE: DATAEFF SPSS A NAVAL POSTGRADUATE SCHOOL

```

*IF (YEAR EQ 83) FLAG =1
*SELECT IF (FLAG EQ 1)
BREAKDOWN TABLES = ACTMH BY STDC/NU835 BY VTYPE/
NU835 BY VTYPE BY STDC/
OPTIONS
STATISTICS ALL
*IF (YEAR EQ 81) FLAG =1
*IF (YEAR EQ 82) FLAG =1
*IF (YEAR EQ 83) FLAG =1
*IF (VTYPE EQ 1) FLAG =1
*IF (VTYPE EQ 2) FLAG =1
*IF (VTYPE EQ 3) FLAG =1
*IF (VTYPE EQ 4) FLAG =1
*IF (VTYPE EQ 5) FLAG =1
*IF (VTYPE EQ 6) FLAG =1
*IF (VTYPE EQ 7) FLAG =1
*IF (VTYPE EQ 8) FLAG =1
*SELECT IF (FLAG EQ 1)
*SELECT IF (FLAG EQ 2)
*SELECT IF (FLAG EQ 3)
BREAKDOWN TABLES = ACTMH BY STDC/NU835 BY VTYPE/
NU835 BY VTYPE BY STDC/
OPTIONS
STATISTICS ALL
*IF (STDC EQ 10) AVGMH = 18.1667
*IF (STDC EQ 11) AVGMH = 31.6261
*IF (STDC EQ 20) AVGMH = 37.6692
*IF (STDC EQ 21) AVGMH = 71.6333
*IF (STDC EQ 22) AVGMH = 65.1667
*IF (STDC EQ 23) AVGMH = 81.6667
*IF (STDC EQ 32) AVGMH = 20.7917
*IF (STDC EQ 33) AVGMH = 71.1875
*IF (STDC EQ 34) AVGMH = 37.7500
*IF (STDC EQ 35) AVGMH = 67.0000
*IF (STDC EQ 37) AVGMH = 15.6000
*IF (STDC EQ 38) AVGMH = 40.0000
*IF (STDC EQ 39) AVGMH = 205.0000
*IF (STDC EQ 40) AVGMH = 30.2500
*IF (STDC EQ 41) AVGMH = 79.1111
*IF (STDC EQ 50) AVGMH = 25.0000
*IF (STDC EQ 51) AVGMH = 13.4000
*IF (YEAR EQ 81) FLAG = 1
*IF (YEAR EQ 82) FLAG = 1
*IF (YEAR EQ 83) FLAG = 1
*SELECT IF (FLAG EQ 1)
*COMPUTE EFF = (.40*(LN(ACTMH/AVGMH)) + .20*(ACTRK-2.556)
+ .25*(LN(INSCR) + .05*(LG10(NU835/3.670))) *100
SCATTERGRAM EFF WITH ACTMH/EFF WITH ACTRK (2,4)/EFF WITH INSCR (-1,1)/
EFF WITH NU835/
OPTIONS
STATISTICS ALL
*IF (STDC EQ 10) AVGMH = 18.1667
*IF (STDC EQ 11) AVGMH = 31.6261
*IF (STDC EQ 20) AVGMH = 37.6692
*IF (STDC EQ 21) AVGMH = 71.6333
*IF (STDC EQ 22) AVGMH = 65.1667
*IF (STDC EQ 23) AVGMH = 81.6667
*IF (STDC EQ 32) AVGMH = 20.7917
*IF (STDC EQ 33) AVGMH = 71.1875
*IF (STDC EQ 34) AVGMH = 37.7500
*IF (STDC EQ 35) AVGMH = 67.0000
*IF (STDC EQ 37) AVGMH = 15.6000
*IF (STDC EQ 38) AVGMH = 40.0000
*IF (STDC EQ 39) AVGMH = 205.0000
*IF (STDC EQ 40) AVGMH = 30.2500
*IF (STDC EQ 41) AVGMH = 79.1111
*IF (STDC EQ 50) AVGMH = 25.0000
*IF (STDC EQ 51) AVGMH = 13.4000
*IF (YEAR EQ 81) FLAG = 1
*IF (YEAR EQ 82) FLAG = 1
*IF (YEAR EQ 83) FLAG = 1
*SELECT IF (FLAG EQ 1)
*COMPUTE EFF = (LN(ACTMH/AVGMH))*100
SCATTERGRAM EFF WITH ACTMH/

```

FILE: DATAEFF SPSS A NAVAL POSTGRADUATE SCHOOL

```
CPTIONS 1,7,8
STATISTICS
*IF ALL
*IF (STDCL 10) AVGMH = 18.1667
*IF (STDCL 11) AVGMH = 31.8261
*IF (STDCL 20) AVGMH = 57.0652
*IF (STDCL 21) AVGMH = 71.8333
*IF (STDCL 22) AVGMH = 65.1667
*IF (STDCL 23) AVGMH = 81.6667
*IF (STDCL 32) AVGMH = 20.7917
*IF (STDCL 33) AVGMH = 71.1875
*IF (STDCL 34) AVGMH = 57.7500
*IF (STDCL 35) AVGMH = 67.0000
*IF (STDCL 37) AVGMH = 15.5000
*IF (STDCL 38) AVGMH = 40.5000
*IF (STDCL 39) AVGMH = 20.5000
*IF (STDCL 40) AVGMH = 30.2500
*IF (STDCL 41) AVGMH = 79.1111
*IF (STDCL 50) AVGMH = 25.0000
*IF (STDCL 51) AVGMH = 134.8000
*IF (YEAR 81) FLAG = 1
*IF (YEAR 82) FLAG = 1
*IF (YEAR 83) FLAG = 1
*IF (FLAG 1)
*SELECT IF
*COMPUTE EFF = (INSCR)*100
*SCATTERGRAM EFF WITH INSCR (-1.1)/EFF WITH NUISP (0.7)/
CPTIONS 1,7,8
STATISTICS
*IF ALL
*IF (STDCL 10) AVGMH = 18.1667
*IF (STDCL 11) AVGMH = 31.8261
*IF (STDCL 20) AVGMH = 57.0652
*IF (STDCL 21) AVGMH = 71.8333
*IF (STDCL 22) AVGMH = 65.1667
*IF (STDCL 23) AVGMH = 81.6667
*IF (STDCL 32) AVGMH = 20.7917
*IF (STDCL 33) AVGMH = 71.1875
*IF (STDCL 34) AVGMH = 57.7500
*IF (STDCL 35) AVGMH = 67.0000
*IF (STDCL 37) AVGMH = 15.5000
*IF (STDCL 38) AVGMH = 40.5000
*IF (STDCL 39) AVGMH = 20.5000
*IF (STDCL 40) AVGMH = 30.2500
*IF (STDCL 41) AVGMH = 79.1111
*IF (STDCL 50) AVGMH = 25.0000
*IF (STDCL 51) AVGMH = 134.8000
*IF (YEAR 81) FLAG = 1
*IF (YEAR 82) FLAG = 1
*IF (YEAR 83) FLAG = 1
*IF (FLAG 1)
*SELECT IF
*COMPUTE EFF = (INSCR)*100
*SCATTERGRAM EFF WITH INSCR (-1.1)/EFF WITH NUISP (0.7)/
CPTIONS 1,7,8
STATISTICS
*IF ALL
*IF (STDCL 10) AVGMH = 18.1667
*IF (STDCL 11) AVGMH = 31.8261
*IF (STDCL 20) AVGMH = 57.0652
*IF (STDCL 21) AVGMH = 71.8333
*IF (STDCL 22) AVGMH = 65.1667
*IF (STDCL 23) AVGMH = 81.6667
*IF (STDCL 32) AVGMH = 20.7917
*IF (STDCL 33) AVGMH = 71.1875
*IF (STDCL 34) AVGMH = 57.7500
*IF (STDCL 35) AVGMH = 67.0000
*IF (STDCL 37) AVGMH = 15.5000
*IF (STDCL 38) AVGMH = 40.5000
*IF (STDCL 39) AVGMH = 20.5000
*IF (STDCL 40) AVGMH = 30.2500
*IF (STDCL 41) AVGMH = 79.1111
*IF (STDCL 50) AVGMH = 25.0000
*IF (STDCL 51) AVGMH = 134.8000
*IF (YEAR 81) FLAG = 1
*IF (YEAR 82) FLAG = 1
*IF (YEAR 83) FLAG = 1
*IF (FLAG 1)
```

FILE: DATAEFF SPSS A NAVAL PCSTGRADUATE SCHOOL

```
*SELECT IF (FLAG EQ 1)
*COMPUTE EFF = (LG10(NU835/5.670)) *100
SCATTERGRAM EFF WITH NU835/
OPTIONS 1,7,8
STATISTICS ALL
(STDCL 10) AVGMH = 18.1667
(STDCL 11) AVGMH = 31.8261
(STDCL 20) AVGMH = 37.0652
(STDCL 21) AVGMH = 71.8333
(STDCL 22) AVGMH = 65.1667
(STDCL 23) AVGMH = 81.6667
(STDCL 32) AVGMH = 20.7917
(STDCL 33) AVGMH = 71.1875
(STDCL 34) AVGMH = 57.1500
(STDCL 35) AVGMH = 67.0000
(STDCL 37) AVGMH = 156.5000
(STDCL 38) AVGMH = 40.5000
(STDCL 39) AVGMH = 203.0000
(STDCL 40) AVGMH = 30.2500
(STDCL 41) AVGMH = 79.1111
(STDCL 50) AVGMH = 25.0000
(STDCL 51) AVGMH = 134.8000
(YEAR 81) FLAG = 1
(YEAR 82) FLAG = 1
(YEAR 83) FLAG = 1
(VTYPE 1) FLAG2 = 2
(VTYPE 2) FLAG2 = 2
(VTYPE 3) FLAG2 = 2
(VTYPE 4) FLAG2 = 2
(ITYPE 1) FLAG3 = 3
(ITYPE 3) FLAG3 = 3
*SELECT IF (FLAG EQ 1)
*SELECT IF (FLAG2 EQ 2)
*SELECT IF (FLAG3 EQ 3)
*COMPUTE EFF = (.40*(LN(AC1MH/AVGMH)) + .30*(ACTRK-2.986)
+ .25*(INSCR) + .05*(LG10(NU835/5.532))) *100
SCATTERGRAM EFF WITH ACTMH/EFF WITH ACTRK (2,4)/EFF WITH INSCR (-1,1)/
OPTIONS 1,7,8
STATISTICS ALL
(STDCL 10) AVGMH = 18.1667
(STDCL 11) AVGMH = 31.8261
(STDCL 20) AVGMH = 37.0652
(STDCL 21) AVGMH = 71.8333
(STDCL 22) AVGMH = 65.1667
(STDCL 23) AVGMH = 81.6667
(STDCL 32) AVGMH = 20.7917
(STDCL 33) AVGMH = 71.1875
(STDCL 34) AVGMH = 57.1500
(STDCL 35) AVGMH = 67.0000
(STDCL 37) AVGMH = 156.5000
(STDCL 38) AVGMH = 40.5000
(STDCL 39) AVGMH = 203.0000
(STDCL 40) AVGMH = 30.2500
(STDCL 41) AVGMH = 79.1111
(STDCL 50) AVGMH = 25.0000
(STDCL 51) AVGMH = 134.8000
(YEAR 81) FLAG = 1
(YEAR 82) FLAG = 1
(YEAR 83) FLAG = 1
(VTYPE 1) FLAG2 = 2
(VTYPE 2) FLAG2 = 2
(VTYPE 3) FLAG2 = 2
(VTYPE 4) FLAG2 = 2
(ITYPE 1) FLAG3 = 3
(ITYPE 3) FLAG3 = 3
*SELECT IF (FLAG EQ 1)
*SELECT IF (FLAG2 EQ 2)
*SELECT IF (FLAG3 EQ 3)
*COMPUTE EFF = (.40*(LN(AC1MH/AVGMH)) *100
SCATTERGRAM EFF WITH ACTMH/
OPTIONS 1,7,8
```


FILE: CATAEFF SPSS A NAVAL POSTGRADUATE SCHOOL

APPENDIX C: COMPUTER TABLES AND LISTINGS

SPSS BATCH SYSTEM APPENDIX C

11/30/83

FILE - MASTER1 - CREATED 11/30/83

RANK RANK OF INSPECTOR (FY-81)

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	2.	41	9.8	9.8	9.8
	3.	154	36.9	36.9	46.6
	4.	113	27.1	27.1	73.9
	5.	31	7.4	7.4	81.3
	6.	8	1.9	1.9	83.2
	11.	1	0.2	0.2	83.5
	12.	2	0.5	0.5	83.9
	22.	20	4.8	4.8	88.7
	23.	24	5.8	5.8	94.5
	24.	23	5.5	5.5	100.0
	TOTAL	417	100.0	100.0	

11/EC/83

RANK RANK CF INSPECTOR (FY-81)

MEAN	6.662	STD. ERR.	0.356	MEDIAN	3.619
MODE	3.000	STD. DEV.	7.263	VARIANCE	52.758
KURTOSIS	1.316	SKEWNESS	1.784	RANGE	22.000
MINIMUM	2.000	MAXIMUM	24.000		
VALID CASES	417	MISSING CASES	0		

SPSS BATCH SYSTEM

11/30/83 FILE - MASTER1 - CREATED 11/30/83

RANK RANK OF INSPECTOR (FY-82)

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	1.	2	0.4	0.4	0.4
	2.	33	6.5	6.5	6.9
	3.	217	43.0	43.0	49.9
	4.	115	22.8	22.8	72.7
	5.	11	2.2	2.2	74.9
	6.	31	6.1	6.1	81.0
	12.	3	0.6	0.6	81.6
	17.	2	0.4	0.4	82.0
	22.	43	8.5	8.5	90.5
	23.	21	4.2	4.2	94.7
	24.	27	5.3	5.3	100.0
TOTAL		505	100.0	100.0	

SPSS BATCH SYSTEM

11/30/83

FILE - MASTER1 - CREATED 11/30/83

RANK RANK OF INSPECTOR (FY-82)

COCE

1. * (2)

2. **** (33)

3. ***** (217)

4. ***** (115)

5. ** (11)

6. *** (31)

12. (3)

17. * (2)

22. ***** (43)

23. *** (21)

24. **** (27)

0.....100.....200.....300.....400.....500
FREQUENCY

MEAN	7.063	STD ERR	0.335	MEDIAN	3.504
MODE	3.000	STD DEV	7.534	VARIANCE	57.756
KURTOSIS	0.617	SKEWNESS	1.580	RANGE	23.000
MINIMUM	1.000	MAXIMUM	24.000		

VALID CASES 505 MISSING CASES 0

SPSS BATCH SYSTEM

11/20/83

FILE - MASTER1 - CREATED 11/20/83

RANK RANK CF INSPECTOR (FY-83)

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	1.	10	3.3	3.3	3.3
	2.	48	15.6	15.6	18.9
	3.	119	38.8	38.8	57.7
	4.	28	9.1	9.1	66.8
	5.	3	1.0	1.0	67.8
	12.	1	0.3	0.3	68.1
	13.	1	0.3	0.3	68.4
	17.	7	2.3	2.3	70.7
	22.	60	19.5	19.5	90.2
	23.	18	5.9	5.9	96.1
	24.	12	3.9	3.9	100.0
	TOTAL	307	100.0	100.0	

11/20/83

RANK	RANK OF INSPECTOR (FY-83)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34
35	35
36	36
37	37
38	38
39	39
40	40
41	41
42	42
43	43
44	44
45	45
46	46
47	47
48	48
49	49
50	50
51	51
52	52
53	53
54	54
55	55
56	56
57	57
58	58
59	59
60	60
61	61
62	62
63	63
64	64
65	65
66	66
67	67
68	68
69	69
70	70
71	71
72	72
73	73
74	74
75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

```

1. *** ( 10)
|
|
2. **** ( 48)
|
|
3. **** ( 119)
|
|
4. **** ( 28)
|
|
5. ** ( 3)
|
|
12. * ( 1)
|
|
13. * ( 1)
|
|
17. ** ( 7)
|
|
22. **** ( C)
|
|
23. **** ( 18)
|
|
24. *** ( 12)
|
|
.....I.....I.....I.....
C 40 80 120 160
FREQUENCY

```

174

SPSS BATCH SYSTEM

11/30/83

FILE - MASTER1 - CREATED 11/30/83

RANK RANK OF INSPECTOR (CUMULATIVE FY 81-83)

CATEGORY LABEL	CODE	ABSOLUTE FREQ	RELATIVE FREQ (PCT)	ADJUSTED FREQ (PCT)	CUM FREQ (PCT)
	1.	12	1.0	1.0	1.0
	2.	122	9.9	9.9	10.9
	3.	490	39.9	39.9	50.8
	4.	256	20.8	20.8	71.6
	5.	45	3.7	3.7	75.3
	6.	39	3.2	3.2	78.4
	11.	1	0.1	0.1	78.5
	12.	6	0.5	0.5	79.0
	13.	1	0.1	0.1	79.1
	17.	9	0.7	0.7	79.8
	22.	123	10.0	10.0	89.8
	23.	63	5.1	5.1	95.0
	24.	62	5.0	5.0	100.0
	TOTAL	1229	100.0	100.0	

SPSS BATCH SYSTEM

11/30/83

FILE - MASTER1 - CREATED 11/30/83

RANK RANK OF INSPECTOR (CUMULATIVE FY 81-83)

CCCE

```
1. * ( 12)
2. ***** ( 122)
3. ***** ( 490)
4. ***** ( 256)
5. ***** ( 45)
6. ***** ( 39)
11. * ( 1)
12. * ( 6)
13. * ( 1)
17. * ( 9)
22. ***** ( 123)
23. ***** ( 63)
24. ***** ( 62)
.....1.....1.....1.....1.....1
0 100 200 300 400 500
FREQUENCY
```

Following
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PAGES

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CREATION DATE = 11/30/83)

CRITERION VARIABLE HMAN HANNUAL SALARY FOR WORK C F S L B P O P U L A T I O N S

ENDGEN CRWN BY DIST DISTRICT

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			192188.1794	291.3228	314.9034	100300.2076	664
CTA	181		8114.1474	217.8532	2100.905	446374.754	40
CTA	182		6124.1474	153.1111	2310.0000	533600.0000	40
CTA	183		884.1474	22.1000	474.7141	225400.0000	40
CTA	184		1424.1474	35.6000	144.2184	7074.7384	40
CTA	185		484.1474	12.1000	30.9158	9248.843	40
CTA	186		478.1474	11.9500	10.0000	100	40
CTA	187		64.1474	1.6000	1.0000	1.0000	40
CTA	188		64.1474	1.6000	1.0000	1.0000	40
CTA	189		1574.1474	39.3500	110.9000	12300.0000	40
CTA	190		1574.1474	39.3500	110.9000	12300.0000	40
CTA	191		1467.1474	36.6750	134.0000	17900.0000	40
CTA	192		1467.1474	36.6750	134.0000	17900.0000	40
CTA	193		1467.1474	36.6750	134.0000	17900.0000	40
CTA	194		1467.1474	36.6750	134.0000	17900.0000	40
CTA	195		1467.1474	36.6750	134.0000	17900.0000	40
CTA	196		1467.1474	36.6750	134.0000	17900.0000	40
CTA	197		1467.1474	36.6750	134.0000	17900.0000	40
CTA	198		1467.1474	36.6750	134.0000	17900.0000	40
CTA	199		1467.1474	36.6750	134.0000	17900.0000	40
CTA	200		1467.1474	36.6750	134.0000	17900.0000	40
CTB	181		32105.1482	424.3344	7644.0000	44377.7593	80
CTB	182		1084.1482	13.4375	1.0000	1.0000	80
CTB	183		1185.1482	14.8125	1.0000	1.0000	80
CTB	184		904.1482	11.3000	1.0000	1.0000	80
CTB	185		1434.1482	17.9250	1.0000	1.0000	80
CTB	186		1434.1482	17.9250	1.0000	1.0000	80
CTB	187		1434.1482	17.9250	1.0000	1.0000	80
CTB	188		1434.1482	17.9250	1.0000	1.0000	80
CTB	189		1434.1482	17.9250	1.0000	1.0000	80
CTB	190		1434.1482	17.9250	1.0000	1.0000	80
CTB	191		1434.1482	17.9250	1.0000	1.0000	80
CTB	192		1434.1482	17.9250	1.0000	1.0000	80
CTB	193		1434.1482	17.9250	1.0000	1.0000	80
CTB	194		1434.1482	17.9250	1.0000	1.0000	80
CTB	195		1434.1482	17.9250	1.0000	1.0000	80
CTB	196		1434.1482	17.9250	1.0000	1.0000	80
CTB	197		1434.1482	17.9250	1.0000	1.0000	80
CTB	198		1434.1482	17.9250	1.0000	1.0000	80
CTB	199		1434.1482	17.9250	1.0000	1.0000	80
CTB	200		1434.1482	17.9250	1.0000	1.0000	80

SPSS BATCH SYSTEM
CRITERION VARIABLE MHAN

11/30/83

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
CTR	281.		17243.1992	257.3000	350.3376	152303.4247	589
CIST	1.		1408.4455	452.2125	474.5849	224200.5503	589
CIST	2.		177.4000	88.0000	64.7421	4195.8792	589
CIST	3.		1415.5995	71.4000	4.541500	64091.3771	589
CIST	4.		700.5000	700.5000	0.0	0.0	589
CIST	5.		529.5000	453.4000	24.0874	5833.6948	589
CIST	6.		624.5000	449.5000	542.8712	23593.0083	589
CIST	7.		312.5000	622.5000	31.0194	9603.0008	589
CIST	8.		143.5000	743.5000	0.0	0.0	589
CIST	9.		705.5000	783.5000	0.0	0.0	589
CIST	10.		1479.5000	82.4444	240.579	3210.4229	589
CIST	11.		142.5000	12.5000	0.0	0.0	589
CIST	12.		140.5000	12.5000	1291.0753	1688.0713	589
CIST	13.		140.5000	12.5000	352.5455	0.0	589
CTR	282.		21451.4487	277.5827	321.0553	103420.0815	789
CIST	1.		171.5000	423.9000	60.0484	350.7240	789
CIST	2.		135.5000	325.5000	0.0	0.0	789
CIST	3.		135.5000	69.5000	7.2459	51.2550	789
CIST	4.		135.5000	419.5000	0.0	0.0	789
CIST	5.		142.5000	142.5000	1.2228	1.4958	789
CIST	6.		142.5000	142.5000	207.0698	0.0	789
CIST	7.		142.5000	607.8500	11.0424	221.70555	789
CIST	8.		142.5000	327.1823	42.7721	1828.15234	789
CIST	9.		142.5000	94.5299	74.0875	540.00032	789
CIST	10.		142.5000	478.5000	0.0	0.0	789
CIST	11.		142.5000	142.5000	11.0424	121.04507	789
CIST	12.		142.5000	142.5000	0.0	0.0	789
CIST	13.		142.5000	423.9000	31.0474	51.22133	789
CIST	14.		142.5000	423.9000	50.0455	517.00355	789
CIST	15.		142.5000	423.9000	25.00225	0.0	789
CTR	283.		20380.6877	382.4071	31.11590	110320.0080	689
CIST	1.		142.5000	63.1571	0.0	0.0	689
CIST	2.		142.5000	77.5000	4.00147	16.012000	689
CIST	3.		142.5000	34.5000	2.01502	4.060000	689
CIST	4.		142.5000	45.5000	0.0	0.0	689
CIST	5.		142.5000	249.5000	1.047441	330.07142	689
CIST	6.		142.5000	104.5000	0.0	0.0	689
CIST	7.		142.5000	77.5000	0.0	0.0	689
CIST	8.		142.5000	200.5000	1.047441	330.07142	689
CIST	9.		142.5000	77.5000	0.0	0.0	689
CIST	10.		142.5000	77.5000	0.0	0.0	689
CIST	11.		142.5000	77.5000	0.0	0.0	689
CIST	12.		142.5000	77.5000	0.0	0.0	689
CIST	13.		142.5000	77.5000	0.0	0.0	689
CIST	14.		142.5000	77.5000	0.0	0.0	689
CIST	15.		142.5000	77.5000	0.0	0.0	689
CTR	381.		14602.4493	210.1576	261.8321	61701.0707	789
CIST	1.		172.4998	152.5000	24.0791	5230.9973	789

SPSS BATCH SYSTEM

11/30/83

CRITERION VARIABLE MMAM

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30
31	31	31	31	31	31	31	31
32	32	32	32	32	32	32	32
33	33	33	33	33	33	33	33
34	34	34	34	34	34	34	34
35	35	35	35	35	35	35	35
36	36	36	36	36	36	36	36
37	37	37	37	37	37	37	37
38	38	38	38	38	38	38	38
39	39	39	39	39	39	39	39
40	40	40	40	40	40	40	40
41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47
48	48	48	48	48	48	48	48
49	49	49	49	49	49	49	49
50	50	50	50	50	50	50	50
51	51	51	51	51	51	51	51
52	52	52	52	52	52	52	52
53	53	53	53	53	53	53	53
54	54	54	54	54	54	54	54
55	55	55	55	55	55	55	55
56	56	56	56	56	56	56	56
57	57	57	57	57	57	57	57
58	58	58	58	58	58	58	58
59	59	59	59	59	59	59	59
60	60	60	60	60	60	60	60
61	61	61	61	61	61	61	61
62	62	62	62	62	62	62	62
63	63	63	63	63	63	63	63
64	64	64	64	64	64	64	64
65	65	65	65	65	65	65	65
66	66	66	66	66	66	66	66
67	67	67	67	67	67	67	67
68	68	68	68	68	68	68	68
69	69	69	69	69	69	69	69
70	70	70	70	70	70	70	70
71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72
73	73	73	73	73	73	73	73
74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76
77	77	77	77	77	77	77	77
78	78	78	78	78	78	78	78
79	79	79	79	79	79	79	79
80	80	80	80	80	80	80	80
81	81	81	81	81	81	81	81
82	82	82	82	82	82	82	82
83	83	83	83	83	83	83	83
84	84	84	84	84	84	84	84
85	85	85	85	85	85	85	85
86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87
88	88	88	88	88	88	88	88
89	89	89	89	89	89	89	89
90	90	90	90	90	90	90	90
91	91	91	91	91	91	91	91
92	92	92	92	92	92	92	92
93	93	93	93	93	93	93	93
94	94	94	94	94	94	94	94
95	95	95	95	95	95	95	95
96	96	96	96	96	96	96	96
97	97	97	97	97	97	97	97
98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100

SPSS BATCH SYSTEM
 CRITERION VARIABLE MMAB
 VARIABLE

11/30/83

	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
CIST	12		3785.6998	378.5699	365.1224	53095.6618	14
CIST	13		4544.6997	605.1749	266.7833	9635.3802	14
CIST	14		4161.6998	708.1749	425.6274	152883.6921	14
CIST	30		379.3999	379.3999	.000	.000	1
TOTAL CASES =			662				

SPSS BATCH SYSTEM

11/30/83

FILE PASTEFL (CREATION DATE = 11/30/83)

----- DESCRIPTION OF SLB POPULATIONS -----
 CRITERION VARIABLE: HMAN PANNURS AVAILABLE FOR WORK
 BROKEN DOWN BY: YR FISCAL YEAR OF INSPECTION
 BY DIST COAST GUARD DISTRICT

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			192588.6794	291.5228	325.9034	106836.2676	662
YR	81.		60586.1980	243.3181	311.4455	100786.8821	499
	1.		10434.3398	43.2150	33.0013	11003.0014	40
	2.		1090.4395	4.3825	2.75636	7.60340	13
	3.		426.7945	1.8288	1.78873	3.20053	9
	4.		177.7500	1.3350	1.33500	1.78225	4
	5.		213.4595	2.9225	2.92250	8.54100	2
	6.		134.5000	1.5000	1.50000	2.25000	2
	7.		134.5000	1.5000	1.50000	2.25000	2
	8.		134.5000	1.5000	1.50000	2.25000	2
	9.		134.5000	1.5000	1.50000	2.25000	2
	10.		134.5000	1.5000	1.50000	2.25000	2
	11.		134.5000	1.5000	1.50000	2.25000	2
	12.		134.5000	1.5000	1.50000	2.25000	2
	13.		134.5000	1.5000	1.50000	2.25000	2
	14.		134.5000	1.5000	1.50000	2.25000	2
	15.		134.5000	1.5000	1.50000	2.25000	2
	16.		134.5000	1.5000	1.50000	2.25000	2
	17.		134.5000	1.5000	1.50000	2.25000	2
	18.		134.5000	1.5000	1.50000	2.25000	2
	19.		134.5000	1.5000	1.50000	2.25000	2
	20.		134.5000	1.5000	1.50000	2.25000	2
	21.		134.5000	1.5000	1.50000	2.25000	2
	22.		134.5000	1.5000	1.50000	2.25000	2
	23.		134.5000	1.5000	1.50000	2.25000	2
	24.		134.5000	1.5000	1.50000	2.25000	2
	25.		134.5000	1.5000	1.50000	2.25000	2
	26.		134.5000	1.5000	1.50000	2.25000	2
	27.		134.5000	1.5000	1.50000	2.25000	2
	28.		134.5000	1.5000	1.50000	2.25000	2
	29.		134.5000	1.5000	1.50000	2.25000	2
	30.		134.5000	1.5000	1.50000	2.25000	2
YR	82.		73510.4445	276.9866	341.2074	116361.4530	499
	1.		144.5000	1.5000	1.50000	2.25000	2
	2.		144.5000	1.5000	1.50000	2.25000	2
	3.		144.5000	1.5000	1.50000	2.25000	2
	4.		144.5000	1.5000	1.50000	2.25000	2
	5.		144.5000	1.5000	1.50000	2.25000	2
	6.		144.5000	1.5000	1.50000	2.25000	2
	7.		144.5000	1.5000	1.50000	2.25000	2
	8.		144.5000	1.5000	1.50000	2.25000	2
	9.		144.5000	1.5000	1.50000	2.25000	2
	10.		144.5000	1.5000	1.50000	2.25000	2
	11.		144.5000	1.5000	1.50000	2.25000	2
	12.		144.5000	1.5000	1.50000	2.25000	2
	13.		144.5000	1.5000	1.50000	2.25000	2
	14.		144.5000	1.5000	1.50000	2.25000	2
	15.		144.5000	1.5000	1.50000	2.25000	2
	16.		144.5000	1.5000	1.50000	2.25000	2
	17.		144.5000	1.5000	1.50000	2.25000	2
	18.		144.5000	1.5000	1.50000	2.25000	2
	19.		144.5000	1.5000	1.50000	2.25000	2
	20.		144.5000	1.5000	1.50000	2.25000	2
	21.		144.5000	1.5000	1.50000	2.25000	2
	22.		144.5000	1.5000	1.50000	2.25000	2
	23.		144.5000	1.5000	1.50000	2.25000	2
	24.		144.5000	1.5000	1.50000	2.25000	2
	25.		144.5000	1.5000	1.50000	2.25000	2
	26.		144.5000	1.5000	1.50000	2.25000	2
	27.		144.5000	1.5000	1.50000	2.25000	2
	28.		144.5000	1.5000	1.50000	2.25000	2
	29.		144.5000	1.5000	1.50000	2.25000	2
	30.		144.5000	1.5000	1.50000	2.25000	2
YR	83.		58491.2359	292.5586	370.4626	137242.5532	499
	1.		2044.5595	127.7875	126.5307	16000.6295	10
DIST							

SPSS BATCH SYSTEM
CRITERION VARIABLE MMAM

11/30/83

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
1	2		2130.7000	940.2333	370.9008	137507.3999	31
2	3		15840.2500	330.3830	281.0112	79177.7127	59
3	4		1477.0000	738.8450	941.2092	985927.7238	23
4	5		534.7000	930.7000	0.0000	0.0000	23
5	6		3200.7000	100.2375	1.2743	1.6239	20
6	7		1459.7998	200.4999	67.2730	4526.1139	61
7	8		2712.0000	400.7000	34.0000	1160.0000	51
8	9		200.8500	40.1700	1.3224	1.7398	51
9	10		1000.1996	100.7450	2.1104	4.4535	41
10	11		1470.1568	139.0800	3.4528	11.9205	41
11	12		542.0499	47.3250	3.7423	13.9957	41

TOTAL CASES = 662

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CREATION DATE = 11/30/83)

----- DESCRIPTION OF SUBPOPULATIONS -----

CRITERION VARIABLE: HHLT
BROKEN CLWA BY: DIST
HIGHLIGHTS LIST TO TRAVEL
CLUSTER AND FISCAL YEAR
CLASH GUARD DISTRICT

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FCP ENTIRE POPULATION			33754.5577	50.5888	63.8332	7031.5537	6621
CTR	181.		1147.1999	28.0800	34.3089	1177.0980	40
DIST	1.		28.0800	28.0800	34.3089	1177.0980	40
DIST	2.		88.0000	44.0000	34.3089	1177.0980	40
DIST	3.		240.0000	240.0000	34.3089	1177.0980	40
DIST	4.		81.0000	81.0000	34.3089	1177.0980	40
DIST	5.		18.0000	18.0000	34.3089	1177.0980	40
DIST	6.		49.0000	49.0000	34.3089	1177.0980	40
DIST	7.		37.0000	37.0000	34.3089	1177.0980	40
DIST	8.		340.0000	340.0000	34.3089	1177.0980	40
DIST	9.		240.0000	240.0000	34.3089	1177.0980	40
CTR	182.		2616.3998	42.6727	14.7473	1073.0938	66
DIST	1.		18.0000	18.0000	14.7473	1073.0938	66
DIST	2.		88.0000	88.0000	14.7473	1073.0938	66
DIST	3.		143.0000	143.0000	14.7473	1073.0938	66
DIST	4.		41.0000	41.0000	14.7473	1073.0938	66
DIST	5.		18.0000	18.0000	14.7473	1073.0938	66
DIST	6.		18.0000	18.0000	14.7473	1073.0938	66
DIST	7.		33.0000	33.0000	14.7473	1073.0938	66
DIST	8.		33.0000	33.0000	14.7473	1073.0938	66
DIST	9.		15.0000	15.0000	14.7473	1073.0938	66
DIST	10.		15.0000	15.0000	14.7473	1073.0938	66
DIST	11.		15.0000	15.0000	14.7473	1073.0938	66
DIST	12.		15.0000	15.0000	14.7473	1073.0938	66
DIST	13.		15.0000	15.0000	14.7473	1073.0938	66
DIST	14.		15.0000	15.0000	14.7473	1073.0938	66
DIST	15.		15.0000	15.0000	14.7473	1073.0938	66
DIST	16.		15.0000	15.0000	14.7473	1073.0938	66
DIST	17.		15.0000	15.0000	14.7473	1073.0938	66
CTR	183.		5118.0496	63.9736	67.0565	4102.2408	80
DIST	1.		15.0000	15.0000	67.0565	4102.2408	80
DIST	2.		43.0000	43.0000	67.0565	4102.2408	80
DIST	3.		147.0000	147.0000	67.0565	4102.2408	80
DIST	4.		58.0000	58.0000	67.0565	4102.2408	80
DIST	5.		88.0000	88.0000	67.0565	4102.2408	80
DIST	6.		88.0000	88.0000	67.0565	4102.2408	80
DIST	7.		88.0000	88.0000	67.0565	4102.2408	80
DIST	8.		88.0000	88.0000	67.0565	4102.2408	80
DIST	9.		88.0000	88.0000	67.0565	4102.2408	80
DIST	10.		88.0000	88.0000	67.0565	4102.2408	80
DIST	11.		88.0000	88.0000	67.0565	4102.2408	80
DIST	12.		88.0000	88.0000	67.0565	4102.2408	80
DIST	13.		88.0000	88.0000	67.0565	4102.2408	80
DIST	14.		88.0000	88.0000	67.0565	4102.2408	80
DIST	15.		88.0000	88.0000	67.0565	4102.2408	80
DIST	16.		88.0000	88.0000	67.0565	4102.2408	80
DIST	17.		88.0000	88.0000	67.0565	4102.2408	80

11/30/83

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N		
CTR CENTRAL TENDENCY MEASURE	281.	1972.0000 1973.0000 1974.0000 1975.0000 1976.0000 1977.0000 1978.0000 1979.0000 1980.0000 1981.0000 1982.0000 1983.0000 1984.0000 1985.0000 1986.0000 1987.0000 1988.0000 1989.0000 1990.0000 1991.0000	39440.0000 39460.0000 39480.0000 39500.0000 39520.0000 39540.0000 39560.0000 39580.0000 39600.0000 39620.0000 39640.0000 39660.0000 39680.0000 39700.0000 39720.0000 39740.0000 39760.0000 39780.0000 39800.0000 39820.0000 39840.0000	197.2000 197.3000 197.4000 197.5000 197.6000 197.7000 197.8000 197.9000 198.0000 198.1000 198.2000 198.3000 198.4000 198.5000 198.6000 198.7000 198.8000 198.9000 199.0000 199.1000	24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873 24.0873	1302.2965 1302.2965	581 581		
	282.	3280.0000 3281.0000 3282.0000 3283.0000 3284.0000 3285.0000 3286.0000 3287.0000 3288.0000 3289.0000 3290.0000 3291.0000 3292.0000 3293.0000 3294.0000 3295.0000 3296.0000 3297.0000 3298.0000 3299.0000 3300.0000	65600.0000 65620.0000 65640.0000 65660.0000 65680.0000 65700.0000 65720.0000 65740.0000 65760.0000 65780.0000 65800.0000 65820.0000 65840.0000 65860.0000 65880.0000 65900.0000 65920.0000 65940.0000 65960.0000 65980.0000 66000.0000	328.0000 328.1000 328.2000 328.3000 328.4000 328.5000 328.6000 328.7000 328.8000 328.9000 329.0000 329.1000 329.2000 329.3000 329.4000 329.5000 329.6000 329.7000 329.8000 329.9000 330.0000	33.4324 33.4324	1117.7119 1117.7119	748 748		
	CTR CENTRAL TENDENCY MEASURE	283.	4880.0000 4881.0000 4882.0000 4883.0000 4884.0000 4885.0000 4886.0000 4887.0000 4888.0000 4889.0000 4890.0000 4891.0000 4892.0000 4893.0000 4894.0000 4895.0000 4896.0000 4897.0000 4898.0000 4899.0000 4900.0000	97600.0000 97620.0000 97640.0000 97660.0000 97680.0000 97700.0000 97720.0000 97740.0000 97760.0000 97780.0000 97800.0000 97820.0000 97840.0000 97860.0000 97880.0000 97900.0000 97920.0000 97940.0000 97960.0000 97980.0000 98000.0000	488.0000 488.1000 488.2000 488.3000 488.4000 488.5000 488.6000 488.7000 488.8000 488.9000 489.0000 489.1000 489.2000 489.3000 489.4000 489.5000 489.6000 489.7000 489.8000 489.9000 490.0000	48.8000 48.8100 48.8200 48.8300 48.8400 48.8500 48.8600 48.8700 48.8800 48.8900 48.9000 48.9100 48.9200 48.9300 48.9400 48.9500 48.9600 48.9700 48.9800 48.9900 49.0000	11.6041 11.6041	146676.1613 146676.1613	691 691
		284.	5920.0000 5921.0000 5922.0000 5923.0000 5924.0000 5925.0000 5926.0000 5927.0000 5928.0000 5929.0000 5930.0000 5931.0000 5932.0000 5933.0000 5934.0000 5935.0000 5936.0000 5937.0000 5938.0000 5939.0000 5940.0000	118400.0000 118420.0000 118440.0000 118460.0000 118480.0000 118500.0000 118520.0000 118540.0000 118560.0000 118580.0000 118600.0000 118620.0000 118640.0000 118660.0000 118680.0000 118700.0000 118720.0000 118740.0000 118760.0000 118780.0000 118800.0000	592.0000 592.1000 592.2000 592.3000 592.4000 592.5000 592.6000 592.7000 592.8000 592.9000 593.0000 593.1000 593.2000 593.3000 593.4000 593.5000 593.6000 593.7000 593.8000 593.9000 594.0000	59.2000 59.2100 59.2200 59.2300 59.2400 59.2500 59.2600 59.2700 59.2800 59.2900 59.3000 59.3100 59.3200 59.3300 59.3400 59.3500 59.3600 59.3700 59.3800 59.3900 59.4000	12.0041 12.0041	146676.1613 146676.1613	691 691
		CTR CENTRAL TENDENCY MEASURE	381.	3160.0000 3161.0000	6320.0000 6322.0000	316.0000 316.1000	42.0000 42.0000	1902.0000 1902.0000	799 91

SPSI BATCH SYSTEM
CRITERION VARIABLE MHLT

11/30/82

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
Q1ST	1.	133.7500	76.7500	45.2085	2043.8438	(	51
Q2ST	2.	145.5000	18.3889	44.8179	52.0580	(	91
Q3ST	3.	147.0000	59.0000	44.101	165.9758	(	21
Q4ST	4.	40.0000	46.0000	0.0	0.0	(	21
Q5ST	5.	12.5000	75.7500	67.0287	450.4250	(	41
Q6ST	6.	165.0000	88.0000	2.0229	22.1204	(	51
Q7ST	7.	108.0000	35.0000	10.0000	0.0000	(	31
Q8ST	8.	113.0000	37.0000	6.0000	36.0000	(	21
Q9ST	9.	495.0000	43.0000	2.01172	90.10483	(	21
Q10ST	10.	5.0000	0.0000	0.0	0.0	(	101
Q11ST	11.	50.0000	50.0000	10.0000	0.0000	(	101
Q12ST	12.	64.0000	0.0000	0.0	0.0	(	101
CTR	13.	2195.0927	37.0000	26.0000	1497.2253	(	581
Q13ST	14.	61.0000	15.0000	4.0000	16.0000	(	21
Q14ST	15.	893.0000	0.0000	0.0000	0.0000	(	201
Q15ST	16.	46.0000	30.0000	46.0000	30.0000	(	21
Q16ST	17.	113.0000	1.0000	4.0000	22.0000	(	21
Q17ST	18.	2.0000	0.0000	0.0	0.0	(	21
Q18ST	19.	185.0000	4.0000	1.0000	1.0000	(	21
Q19ST	20.	42.0000	0.0000	0.0000	0.0000	(	21
Q20ST	21.	45.0000	15.0000	4.0000	16.0000	(	21
Q21ST	22.	5.0000	0.0000	0.0	0.0	(	21
Q22ST	23.	35.0000	25.0000	0.0000	0.0000	(	21
Q23ST	24.	35.0000	4.0000	0.0000	0.0000	(	21
CTR	25.	384.0000	53.0000	13.0000	1799.9000	(	721
Q24ST	26.	28.0000	0.0000	0.0000	0.0000	(	51
Q25ST	27.	967.0000	0.0000	0.0000	0.0000	(	61
Q26ST	28.	51.0000	37.0000	10.0000	10.0000	(	11
Q27ST	29.	121.0000	10.0000	3.0000	9.0000	(	61
Q28ST	30.	34.0000	30.0000	0.0	0.0	(	41
Q29ST	31.	70.0000	70.0000	1.0000	1.0000	(	51
Q30ST	32.	19.0000	30.0000	1.0000	1.0000	(	41
Q31ST	33.	19.0000	0.0000	0.0000	0.0000	(	41
Q32ST	34.	120.0000	0.0000	0.0000	0.0000	(	41
Q33ST	35.	12.0000	0.0000	0.0000	0.0000	(	151
Q34ST	36.	12.0000	0.0000	0.0000	0.0000	(	151
Q35ST	37.	31.0000	1.0000	1.0000	1.0000	(	21
CTR	38.	510.0000	80.0000	13.0000	1789.0900	(	621
Q36ST	39.	1.0000	1.0000	0.0000	0.0000	(	41
Q37ST	40.	1.0000	1.0000	0.0000	0.0000	(	41
Q38ST	41.	1.0000	1.0000	0.0000	0.0000	(	41
Q39ST	42.	1.0000	1.0000	0.0000	0.0000	(	41
Q40ST	43.	1.0000	1.0000	0.0000	0.0000	(	41

11/30/83

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
C1ST	3	7500	188.9500	62.3835	6767.0436	51	
C1ST	4	1200	177.9578	42.9137	1841.3333	51	
C1ST	5	1600	166.9500	41.9076	1756.3333	51	
C1ST	6	2000	155.9500	39.9000	1592.0000	51	
C1ST	7	2400	144.9500	37.9000	1436.0000	51	
C1ST	8	2800	133.9500	35.9000	1278.0000	51	
C1ST	9	3200	122.9500	33.9000	1146.0000	51	
C1ST	10	3600	111.9500	31.9000	1022.0000	51	
C1ST	11	4000	100.9500	29.9000	894.0000	51	
C1ST	12	4400	89.9500	27.9000	772.0000	51	
C1ST	13	4800	78.9500	25.9000	666.0000	51	
C1ST	14	5200	67.9500	23.9000	566.0000	51	
C1ST	15	5600	56.9500	21.9000	476.0000	51	
C1ST	16	6000	45.9500	19.9000	396.0000	51	
C1ST	17	6400	34.9500	17.9000	322.0000	51	
C1ST	18	6800	23.9500	15.9000	254.0000	51	
C1ST	19	7200	12.9500	13.9000	192.0000	51	
C1ST	20	7600	1.9500	11.9000	140.0000	51	
C1ST	21	8000	.9500	10.9000	118.0000	51	
C1ST	22	8400	.9500	9.9000	98.0000	51	
C1ST	23	8800	.9500	8.9000	78.0000	51	
C1ST	24	9200	.9500	7.9000	62.0000	51	
C1ST	25	9600	.9500	6.9000	47.0000	51	
C1ST	26	10000	.9500	5.9000	34.0000	51	
C1ST	27	10400	.9500	4.9000	24.0000	51	
C1ST	28	10800	.9500	3.9000	15.0000	51	
C1ST	29	11200	.9500	2.9000	8.0000	51	
C1ST	30	11600	.9500	1.9000	3.0000	51	
C1ST	31	12000	.9500	.9000	.8000	51	
C1ST	32	12400	.9500	.9000	.8000	51	
C1ST	33	12800	.9500	.9000	.8000	51	
C1ST	34	13200	.9500	.9000	.8000	51	
C1ST	35	13600	.9500	.9000	.8000	51	
C1ST	36	14000	.9500	.9000	.8000	51	
C1ST	37	14400	.9500	.9000	.8000	51	
C1ST	38	14800	.9500	.9000	.8000	51	
C1ST	39	15200	.9500	.9000	.8000	51	
C1ST	40	15600	.9500	.9000	.8000	51	
C1ST	41	16000	.9500	.9000	.8000	51	
C1ST	42	16400	.9500	.9000	.8000	51	
C1ST	43	16800	.9500	.9000	.8000	51	
C1ST	44	17200	.9500	.9000	.8000	51	
C1ST	45	17600	.9500	.9000	.8000	51	
C1ST	46	18000	.9500	.9000	.8000	51	
C1ST	47	18400	.9500	.9000	.8000	51	
C1ST	48	18800	.9500	.9000	.8000	51	
C1ST	49	19200	.9500	.9000	.8000	51	
C1ST	50	19600	.9500	.9000	.8000	51	
C1ST	51	20000	.9500	.9000	.8000	51	
C1ST	52	20400	.95				
CTR	382.	2492	280.9181	23.9101	730.0887	581	
CTR	383.	2500	275.9175	23.9090	680.0823	581	
CTR	384.	2500	269.9167	23.9080	630.0759	581	
CTR	385.	2500	264.9160	23.9070	580.0695	581	
CTR	386.	2500	259.9152	23.9060	530.0631	581	
CTR	387.	2500	254.9145	23.9050	480.0567	581	
CTR	388.	2500	249.9137	23.9040	430.0503	581	
CTR	389.	2500	244.9130	23.9030	380.0439	581	
CTR	390.	2500	239.9122	23.9020	330.0375	581	
CTR	391.	2500	234.9115	23.9010	280.0311	581	
CTR	392.	2500	229.9107	23.9000	230.0247	581	
CTR	393.	2500	224.9100	23.8990	180.0183	581	
CTR	394.	2500	219.9092	23.8980	130.0119	581	
CTR	395.	2500	214.9085	23.8970	80.0055	581	
CTR	396.	2500	209.9077	23.8960	30.0000	581	
CTR	397.	2500	204.9070	23.8950	.7200	581	
CTR	398.	2500	199.9062	23.8940		581	
CTR	399.	2500	194.9055	23.8930		581	
CTR	400.	2500	189.9047	23.8920		581	
CTR	401.	2500	184.9040	23.8910		581	
CTR	402.	2500	179.9032	23.8900		581	
CTR	403.	2500	174.9025	23.8890		581	
CTR	404.	2500	169.9017	23.8880		581	
CTR	405.	2500	164.9010	23.8870		581	
CTR	406.	2500	159.9002	23.8860		581	
CTR	407.	2500	154.9000	23.8850		581	
CTR	408.	2500	149.9000	23.8840		581	
CTR	409.	2500	144.9000	23.8830		581	
CTR	410.	2500	139.9000	23.8820		581	
CTR	411.	2500	134.9000	23.8810		581	
CTR	412.	2500	129.9000	23.8800		581	
CTR	413.	2500	124.9000	23.8790		581	
CTR	414.	2500	119.9000	23.8780		581	
CTR	415.	2500	114.9000	23.8770		581	
CTR	416.	2500	109.9000	23.8760		581	
CTR	417.	2500	104.9000	23.8750		581	
CTR	418.	2500	99.9000	23.8740		581	
CTR	419.	2500	94.9000	23.8730		581	
CTR	420.	2500	89.9000	23.8720		581	
CTR	421.	2500	84.9000	23.8710		581	
CTR	422.	2500	79.9000	23.8700		581	
CTR	423.	2500	74.9000	23.8690		581	
CTR	424.	2500	69.9000	23.8680		581	
CTR	425.	2500	64.9000	23.8670		581	
CTR	426.	2500	59.9000	23.8660		581	
CTR	427.	2500	54.9000	23.8650		581	
CTR	428.	2500	49.9000	23.8640		581	
CTR	429.	2500	44.9000	23.8630		581	
CTR	430.	2500	39.9000	23.8620		581	
CTR	431.	2500	34.9000	23.8610		581	
CTR	432.	2500	29.9000	23.8600		581	
CTR	433.	2500	24.9000	23.8590		581	
CTR	434.	2500	19.9000	23.8580		581	
CTR	435.	2500	14.9000	23.8570		581	
CTR	436.	2500	9.9000	23.8560		581	
CTR	437.	2500	4.9000	23.8550		581	
CTR	438.	2500	.9000	23.8540		581	
CTR	439.	2500	.9000	23.8530		581	
CTR	440.	2500	.9000	23.8520		581	
CTR	441.	2500	.9000	23.8510		581	
CTR	442.	2500	.9000	23.8500		581	
CTR	443.	2500	.9000	23.8490		581	
CTR	444.	2500	.9000	23.8480		581	
CTR	445.	2500	.9000	23.8470		581	
CTR	446.	2500	.9000	23.8460		581	
CTR	447.	2500	.9000	23.8450		581	
CTR	448.	2500	.9000	23.8440		581	
CTR	449.	2500	.9000	23.8430		581	
CTR	450.	2500	.9000	23.8420		581	
CTR	451.	2500	.9000	23.8410		581	
CTR	452.	2500	.9000	23.8400		581	
CTR	453.	2500	.9000	23.8390		581	
CTR	454.	2500	.9000	23.8380		581	
CTR	455.	2500	.9000	23.8370		581	
CTR	456.	2500	.9000	23.8360		581	
CTR	457.	2500	.9000	23.8350		581	
CTR	458.	2500	.9000	23.8340		581	
CTR	459.	2500	.9000	23.8330		581	
CTR	460.	2500	.9000	23.8320		581	
CTR	461.	2500	.9000	23.8310		581	
CTR	462.	2500	.9000	23.8300		581	
CTR	463.	2500	.9000	23.8290		581	
CTR	464.	2500	.9000	23.8280		581	
CTR	465.	2500	.9000	23.8270		581	
CTR	466.	2500	.9000	23.8260		581	
CTR	467.	2500	.9000	23.8250		581	
CTR	468.	2500	.9000	23.8240		581	
CTR	469.	2500	.9000	23.8230		581	
CTR	470.	2500	.9000	23.8220		581	
CTR	471.	2500	.9000	23.8210		581	
CTR	472.	2500	.9000	23.8200		581	
CTR	473.	2500	.9000	23.8190		581	
CTR	474.	2500	.9000	23.8180		581	
CTR	475.	2500	.9000	23.8170		581	
CTR	476.	2500	.9000	23.8160		581	
CTR	477.	2500	.9000	23.8150		581	
CTR	478.	2500	.9000	23.8140		581	
CTR	479.	2500	.9000	23.8130		581	
CTR	480.	2500	.9000	23.8120		581	
CTR	481.	2500	.9000	23.8110		581	
CTR	482.	2500	.9000	23.8100		581	
CTR	483.	2500	.9000	23.8090		581	
CTR	484.	2500	.9000	23.8080		581	
CTR	485.	2500	.9000	23.8070		581	
CTR	486.	2500	.9000	23.8060		581	
CTR	487.	2500	.9000	23.8050		581	
CTR	488.	2500	.9000	23.8040		581	
CTR	489.	2500	.9000	23.8030		581	
CTR	490.	2500	.9000	23.8020		581	
CTR	491.	2500	.9000	23.8010		581	
CTR	492.	2500	.9000	23.8000		581	
CTR	493.	2500	.9000	23.7990		581	
CTR	494.	2500	.9000	23.7980		581	
CTR	495.	2500	.9000	23.7970		581	
CTR	496.	2500	.9000	23.7960		581	
CTR	497.	2500	.9000	23.7950		581	
CTR	498.	2500	.9000	23.7940		581	
CTR	499.	2500	.9000	23.7930		581	
CTR	500.	2500	.9000	23.7920		581	
CTR	501.	2500	.9000	23.7910		581	
CTR	502.	2500	.9000	23.7900		581	
CTR	503.	2500	.9000	23.7890		581	
CTR	504.	2500	.9000	23.7880		581	
CTR	505.	2500	.9000	23.7870		581	
CTR	506.	2500	.9000	23.7860		581	
CTR	507.	2500	.9000	23.7850		581	
CTR	508.	2500	.9000	23.7840		581	
CTR	509.	2500	.9000	23.7830		581	
CTR	510.	2500	.9000	23.7820		581	
CTR	511.	2500	.9000	23.7810		581	
CTR	512.	2500	.9000	23.7800		581	
CTR	513.	2500	.9000	23.7790		581	
CTR	514.	2500	.9000	23.7780		581	
CTR	515.	2500	.9000	23.7770		581	
CTR	516.	2500	.9000	23.7760		581	
CTR	517.	2500	.9000	23.7750		581	
CTR	518.	2500	.9000	23.7740		581	
CTR	519.	2500	.9000	23.7730		581	
CTR	520.	2500	.9000	23.7720		581	
CTR	521.	2500	.9000	23.7710		581	
CTR	522.	2500	.9000	23.7700		581	
CTR	523.	2500	.9000	23.7690		581	
CTR	524.	2500	.9000	23.7680		581	
CTR	525.	2500	.9000	23.7670		581	
CTR	526.	2500	.9000	23.7660			

SPSS BATCH SYSTEM
 CRITERION VARIABLE MMCT
 VARIABLE

11/30/83

	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
MMCT	12.	809.4500	80.9450	43.5867	1898.0547	1	101
MMCT	13.	222.1500	22.2150	7.47583	1033.1085	1	41
MMCT	14.	2245.1950	224.5195	242.4522	62227.7226	1	21
MMCT	30.	110.2500	11.0250	0.00	0.00	1	21

TOTAL CASES = 662

SPSS BATCH SYSTEM
CRITERIA VARIABLE MMLT

11/30/83

VARIABLE	CODE	VALLE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
1.	2.		194.0000	8.0000	2.0000	99.0000	24
2.	3.		312.0000	13.0000	4.0000	169.0000	24
3.	4.		82.0000	3.4167	1.0000	1.0000	24
4.	5.		88.0000	3.6667	1.0000	1.0000	24
5.	6.		88.0000	3.6667	1.0000	1.0000	24
6.	7.		153.0000	6.3750	1.0000	1.0000	24
7.	8.		153.0000	6.3750	1.0000	1.0000	24
8.	9.		153.0000	6.3750	1.0000	1.0000	24
9.	10.		153.0000	6.3750	1.0000	1.0000	24
10.	11.		153.0000	6.3750	1.0000	1.0000	24
11.	12.		153.0000	6.3750	1.0000	1.0000	24
12.	13.		153.0000	6.3750	1.0000	1.0000	24
13.	14.		153.0000	6.3750	1.0000	1.0000	24
14.	15.		153.0000	6.3750	1.0000	1.0000	24
15.	16.		153.0000	6.3750	1.0000	1.0000	24
16.	17.		153.0000	6.3750	1.0000	1.0000	24
17.	18.		153.0000	6.3750	1.0000	1.0000	24

TOTAL CASES = 24

11/30/83

11/30/83

11/30/83

11/30/83

AD-A138 898

INSPECTION OF US FLAG VESSELS IN FOREIGN COUNTRIES AN
APPLICATION OF COST EFFECTIVENESS ANALYSIS(U) NAVAL
POSTGRADUATE SCHOOL MONTEREY CA M E ASHLEY ET AL.

3/3

UNCLASSIFIED

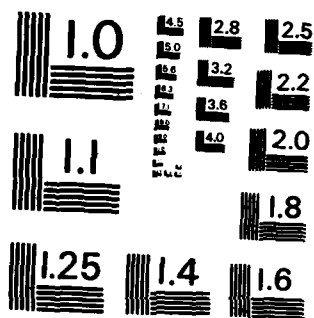
DEC 83

F/G 5/1

NL

END

100
100
100



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

11/30/43

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
CTR	28		15715.9992	231.0017	400.8770	160661.9999	581
CTR		1	1569.0000	44.0000	44.0000	1936.0000	581
CTR		2	1569.0000	44.0000	44.0000	1936.0000	581
CTR		3	1569.0000	44.0000	44.0000	1936.0000	581
CTR		4	1569.0000	44.0000	44.0000	1936.0000	581
CTR		5	1569.0000	44.0000	44.0000	1936.0000	581
CTR		6	1569.0000	44.0000	44.0000	1936.0000	581
CTR		7	1569.0000	44.0000	44.0000	1936.0000	581
CTR		8	1569.0000	44.0000	44.0000	1936.0000	581
CTR		9	1569.0000	44.0000	44.0000	1936.0000	581
CTR		10	1569.0000	44.0000	44.0000	1936.0000	581
CTR		11	1569.0000	44.0000	44.0000	1936.0000	581
CTR		12	1569.0000	44.0000	44.0000	1936.0000	581
CTR		13	1569.0000	44.0000	44.0000	1936.0000	581
CTR		14	1569.0000	44.0000	44.0000	1936.0000	581
CTR		15	1569.0000	44.0000	44.0000	1936.0000	581
CTR		16	1569.0000	44.0000	44.0000	1936.0000	581
CTR		17	1569.0000	44.0000	44.0000	1936.0000	581
CTR		18	1569.0000	44.0000	44.0000	1936.0000	581
CTR		19	1569.0000	44.0000	44.0000	1936.0000	581
CTR		20	1569.0000	44.0000	44.0000	1936.0000	581
CTR		21	1569.0000	44.0000	44.0000	1936.0000	581
CTR		22	1569.0000	44.0000	44.0000	1936.0000	581
CTR		23	1569.0000	44.0000	44.0000	1936.0000	581
CTR		24	1569.0000	44.0000	44.0000	1936.0000	581
CTR		25	1569.0000	44.0000	44.0000	1936.0000	581
CTR		26	1569.0000	44.0000	44.0000	1936.0000	581
CTR		27	1569.0000	44.0000	44.0000	1936.0000	581
CTR		28	1569.0000	44.0000	44.0000	1936.0000	581
CTR		29	1569.0000	44.0000	44.0000	1936.0000	581
CTR		30	1569.0000	44.0000	44.0000	1936.0000	581
CTR		31	1569.0000	44.0000	44.0000	1936.0000	581
CTR		32	1569.0000	44.0000	44.0000	1936.0000	581
CTR		33	1569.0000	44.0000	44.0000	1936.0000	581
CTR		34	1569.0000	44.0000	44.0000	1936.0000	581
CTR		35	1569.0000	44.0000	44.0000	1936.0000	581
CTR		36	1569.0000	44.0000	44.0000	1936.0000	581
CTR		37	1569.0000	44.0000	44.0000	1936.0000	581
CTR		38	1569.0000	44.0000	44.0000	1936.0000	581
CTR		39	1569.0000	44.0000	44.0000	1936.0000	581
CTR		40	1569.0000	44.0000	44.0000	1936.0000	581
CTR		41	1569.0000	44.0000	44.0000	1936.0000	581
CTR		42	1569.0000	44.0000	44.0000	1936.0000	581
CTR		43	1569.0000	44.0000	44.0000	1936.0000	581
CTR		44	1569.0000	44.0000	44.0000	1936.0000	581
CTR		45	1569.0000	44.0000	44.0000	1936.0000	581
CTR		46	1569.0000	44.0000	44.0000	1936.0000	581
CTR		47	1569.0000	44.0000	44.0000	1936.0000	581
CTR		48	1569.0000	44.0000	44.0000	1936.0000	581
CTR		49	1569.0000	44.0000	44.0000	1936.0000	581
CTR		50	1569.0000	44.0000	44.0000	1936.0000	581
CTR		51	1569.0000	44.0000	44.0000	1936.0000	581
CTR		52	1569.0000	44.0000	44.0000	1936.0000	581
CTR		53	1569.0000	44.0000	44.0000	1936.0000	581
CTR		54	1569.0000	44.0000	44.0000	1936.0000	581
CTR		55	1569.0000	44.0000	44.0000	1936.0000	581
CTR		56	1569.0000	44.0000	44.0000	1936.0000	581
CTR		57	1569.0000	44.0000	44.0000	1936.0000	581
CTR		58	1569.0000	44.0000	44.0000	1936.0000	581
CTR		59	1569.0000	44.0000	44.0000	1936.0000	581
CTR		60	1569.0000	44.0000	44.0000	1936.0000	581
CTR		61	1569.0000	44.0000	44.0000	1936.0000	581
CTR		62	1569.0000	44.0000	44.0000	1936.0000	581
CTR		63	1569.0000	44.0000	44.0000	1936.0000	581
CTR		64	1569.0000	44.0000	44.0000	1936.0000	581
CTR		65	1569.0000	44.0000	44.0000	1936.0000	581
CTR		66	1569.0000	44.0000	44.0000	1936.0000	581
CTR		67	1569.0000	44.0000	44.0000	1936.0000	581
CTR		68	1569.0000	44.0000	44.0000	1936.0000	581
CTR		69	1569.0000	44.0000	44.0000	1936.0000	581
CTR		70	1569.0000	44.0000	44.0000	1936.0000	581
CTR		71	1569.0000	44.0000	44.0000	1936.0000	581
CTR		72	1569.0000	44.0000	44.0000	1936.0000	581
CTR		73	1569.0000	44.0000	44.0000	1936.0000	581
CTR		74	1569.0000	44.0000	44.0000	1936.0000	581
CTR		75	1569.0000	44.0000	44.0000	1936.0000	581
CTR		76	1569.0000	44.0000	44.0000	1936.0000	581
CTR		77	1569.0000	44.0000	44.0000	1936.0000	581
CTR		78	1569.0000	44.0000	44.0000	1936.0000	581
CTR		79	1569.0000	44.0000	44.0000	1936.0000	581
CTR		80	1569.0000	44.0000	44.0000	1936.0000	581
CTR		81	1569.0000	44.0000	44.0000	1936.0000	581
CTR		82	1569.0000	44.0000	44.0000	1936.0000	581
CTR		83	1569.0000	44.0000	44.0000	1936.0000	581
CTR		84	1569.0000	44.0000	44.0000	1936.0000	581
CTR		85	1569.0000	44.0000	44.0000	1936.0000	581
CTR		86	1569.0000	44.0000	44.0000	1936.0000	581
CTR		87	1569.0000	44.0000	44.0000	1936.0000	581
CTR		88	1569.0000	44.0000	44.0000	1936.0000	581
CTR		89	1569.0000	44.0000	44.0000	1936.0000	581
CTR		90	1569.0000	44.0000	44.0000	1936.0000	581
CTR		91	1569.0000	44.0000	44.0000	1936.0000	581
CTR		92	1569.0000	44.0000	44.0000	1936.0000	581
CTR		93	1569.0000	44.0000	44.0000	1936.0000	581
CTR		94	1569.0000	44.0000	44.0000	1936.0000	581
CTR		95	1569.0000	44.0000	44.0000	1936.0000	581
CTR		96	1569.0000	44.0000	44.0000	1936.0000	581
CTR		97	1569.0000	44.0000	44.0000	1936.0000	581
CTR		98	1569.0000	44.0000	44.0000	1936.0000	581
CTR		99	1569.0000	44.0000	44.0000	1936.0000	581
CTR		100	1569.0000	44.0000	44.0000	1936.0000	581
CTR		101	1569.0000	44.0000	44.0000	1936.0000	581
CTR		102	1569.0000	44.0000	44.0000	1936.0000	581
CTR		103	1569.0000	44.0000	44.0000	1936.0000	581
CTR		104	1569.0000	44.0000	44.0000	1936.0000	581
CTR		105	1569.0000	44.0000	44.0000	1936.0000	581
CTR		106	1569.0000	44.0000	44.0000	1936.0000	581
CTR		107	1569.0000	44.0000	44.0000	1936.0000	581
CTR		108	1569.0000	44.0000	44.0000	1936.0000	581
CTR		109	1569.0000	44.0000	44.0000	1936.0000	581
CTR		110	1569.0000	44.0000	44.0000	1936.0000	581
CTR		111	1569.0000	44.0000	44.0000	1936.0000	581
CTR		112	1569.0000	44.0000	44.0000	1936.0000	581
CTR		113	1569.0000	44.0000	44.0000	1936.0000	581
CTR		114	1569.0000	44.0000	44.0000	1936.0000	581
CTR		115	1569.0000	44.0000	44.0000	1936.0000	581
CTR		116	1569.0000	44.0000	44.0000	1936.0000	581
CTR		117	1569.0000	44.0000	44.0000	1936.0000	581
CTR		118	1569.0000	44.0000	44.0000	1936.0000	581
CTR		119	1569.0000	44.0000	44.0000	1936.0000	581
CTR		120	1569.0000	44.0000	44.0000	1936.0000	581
CTR		121	1569.0000	44.0000	44.0000	1936.0000	581
CTR		122	1569.0000	44.0000	44.0000	1936.0000	581
CTR		123	1569.0000	44.0000	44.0000	1936.0000	581
CTR		124	1569.0000	44.0000	44.0000	1936.0000	581
CTR		125	1569.0000	44.0000	44.0000	1936.0000	581
CTR		126	1569.0000	44.0000	44.0000	1936.0000	581
CTR		127	1569.0000	44.0000	44.0000	1936.0000	581
CTR		128	1569.0000	44.0000	44.0000	1936.0000	581
CTR		129	1569.0000	44.0000	44.0000	1936.0000	581
CTR		130	1569.0000	44.0000	44.0000	1936.0000	581
CTR		131	1569.0000	44.0000	44.0000	1936.0000	581
CTR		132	1569.0000	44.0000	44.0000	1936.0000	581
CTR		133	1569.0000	44.0000	44.0000	1936.0000	581
CTR		134	1569.0000	44.0000	44.0000	1936.0000	581
CTR		135	1569.0000	44.0000	44.0000	1936.0000	581
CTR		136	1569.0000	44.0000	44.0000	1936.0000	581
CTR		137	1569.0000	44.0000	44.0000	1936.0000	581
CTR		138	1569.0000	44.0000	44.0000	1936.0000	581
CTR		139	1569.0000	44.0000	44.0000	1936.0000	581
CTR		140	1569.0000	44.0000	44.0000	1936.0000	581
CTR		141	1569.0000	44.0000	44.0000	1936.0000	581
CTR		142	1569.0000	44.0000	44.0000	1936.0000	581
CTR		143	1569.0000	44.0000	44.0000	1936.0000	581
CTR		144	1569.0000	44.0000	44.0000	1936.0000	581
CTR		145	1569.0000	44.0000	44.0000	1936.0000	581
CTR		146	1569.0000	44.0000	44.0000	1936.0000	581
CTR		147	1569.0000	44.0000	44.0000	1936.0000	581
CTR		148	1569.0000	44.0000	44.0000	1936.0000	581
CTR		149	1569.0000	44.0000	44.0000	1936.0000	581
CTR		150	1569.0000	44.0000	44.0000	1936.0000	581
CTR		151	1569.0000	44.0000	4		

SPSS BATCH SYSTEM
 CRITERION VARIABLE HMTOT
 VARIABLE

11/30/83

	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DIS1	12.		1295.2400	422.3390	218.4221	101384.0871	101
DIS2	13.		1001.1400	910.1143	471.1484	141832.0174	101
DIS3	30.		496.2500	496.2500	0.0	0.0	11

TOTAL CASES = 662

SPSS BATCH SYSTEM
 CRITERION VARIABLE PNTOT
 VARIABLE

11/30/81

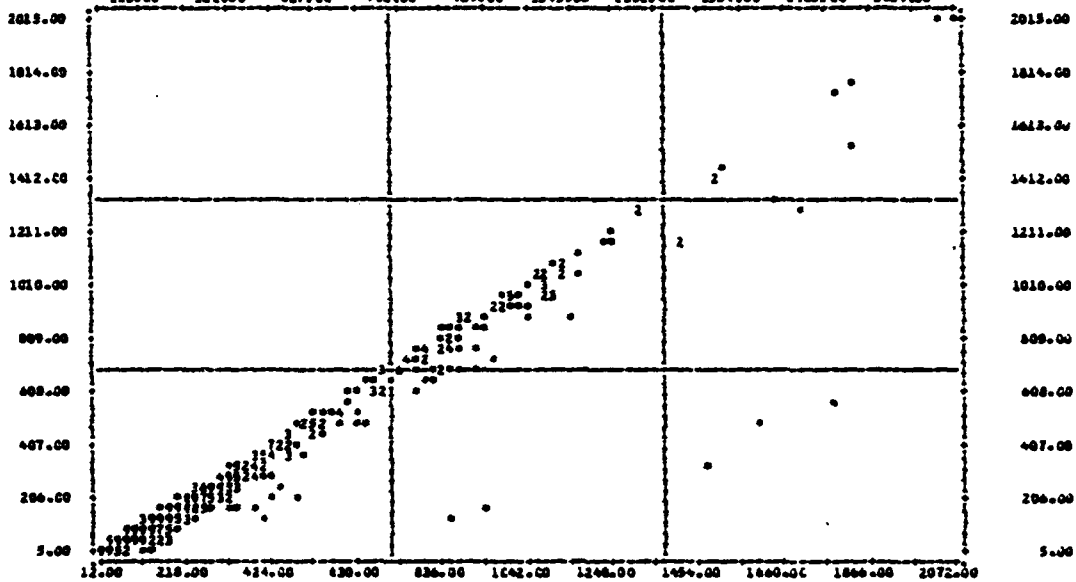
CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE
1	1	1000	1000	0	0
2	2	1000	1000	0	0
3	3	1000	1000	0	0
4	4	1000	1000	0	0
5	5	1000	1000	0	0
6	6	1000	1000	0	0
7	7	1000	1000	0	0
8	8	1000	1000	0	0
9	9	1000	1000	0	0
10	10	1000	1000	0	0
11	11	1000	1000	0	0
12	12	1000	1000	0	0
13	13	1000	1000	0	0
14	14	1000	1000	0	0
15	15	1000	1000	0	0
16	16	1000	1000	0	0
17	17	1000	1000	0	0
18	18	1000	1000	0	0
19	19	1000	1000	0	0
20	20	1000	1000	0	0
21	21	1000	1000	0	0
22	22	1000	1000	0	0
23	23	1000	1000	0	0
24	24	1000	1000	0	0
25	25	1000	1000	0	0
26	26	1000	1000	0	0
27	27	1000	1000	0	0
28	28	1000	1000	0	0
29	29	1000	1000	0	0
30	30	1000	1000	0	0
31	31	1000	1000	0	0
32	32	1000	1000	0	0
33	33	1000	1000	0	0
34	34	1000	1000	0	0
35	35	1000	1000	0	0
36	36	1000	1000	0	0
37	37	1000	1000	0	0
38	38	1000	1000	0	0
39	39	1000	1000	0	0
40	40	1000	1000	0	0
41	41	1000	1000	0	0
42	42	1000	1000	0	0
43	43	1000	1000	0	0
44	44	1000	1000	0	0
45	45	1000	1000	0	0
46	46	1000	1000	0	0
47	47	1000	1000	0	0
48	48	1000	1000	0	0
49	49	1000	1000	0	0
50	50	1000	1000	0	0
51	51	1000	1000	0	0
52	52	1000	1000	0	0
53	53	1000	1000	0	0
54	54	1000	1000	0	0
55	55	1000	1000	0	0
56	56	1000	1000	0	0
57	57	1000	1000	0	0
58	58	1000	1000	0	0
59	59	1000	1000	0	0
60	60	1000	1000	0	0
61	61	1000	1000	0	0
62	62	1000	1000	0	0

TOTAL CASES = 662

SPSS BATCH SYSTEM

11/30/83

FILE PASTES (CREATION DATE = 11/30/83)
 SCATTERGRAM (X) (Y) (Z) AVAILABLE FOR WORK (ACROSS) (HITOT) TOTAL MANHOURS PER CYBERSEAS TAIP
 113.00 321.00 327.00 733.00 939.00 1149.00 1351.00 1557.00 1763.00 1969.00



SPSS BATCH SYSTEM

11/30/82

FILE PASTER1 (CREATION DATE = 11/30/82)

CRITERION VARIABLE		DESCRIBE SUBPOPULATIONS							
BROKEN DOWN BY		QUANTILE		MEAN		STD DEV		VARIANCE	
CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N			
FOR ENTIRE POPULATION		90850.1881	750.4875	931.7388	904276.2478	1229			
CTR	100	71475.1221	695.3475	851.4111	724759.4710	79			
CTR	101	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	102	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	103	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	104	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	105	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	106	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	107	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	108	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	109	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	110	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	111	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	112	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	113	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	114	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	115	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	116	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	117	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	118	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	119	11412.1221	113.1221	101.1221	10225.5003	11			
CTR	120	11412.1221	113.1221	101.1221	10225.5003	11			

TOTAL CASES = 1229

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CRASH DATE = 11/30/83)

CRITERION VARIABLE		DESCRIPTION OF SUBPOPULATIONS					
CRASH DATE BY	VR	AMOUNT BILLED	FISCAL YEAR OF INSPECTION				
VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			908830.1331	739.4875	971.7388	944274.2478	1229
VR	01		117799.3881	899.1900	1112.7000	1231500.0000	1331
VR	02		220799.3881	975.4378	1412.7000	2001500.0000	1331

TOTAL CASES = 1229

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CREATION DATE = 11/30/83)

CRITERION VARIABLE		DESCRIPTION OF SUBPOPULATIONS					
BROKEN DOWN BY	CODE	BILLING DATE BEGINNING DATE	FISCAL YEAR OF INSPECTION	SUM	MEAN	STD DEV	VARIANCE N
VARIABLE	CODE	VALUE LABEL					
FOR ENTIRE POPULATION				243797.0000	198.3377	167.0404	11456.9290 1229
VR	81-			84213.0000	262.1894	161.4475	10334.2789 417
VR	82-			101042.0000	260.1227	161.3144	10333.6304 395
VR	83-			58542.0000	180.1629	61.0167	2393.6270 337
TOTAL CASES = 1229							

SPSS BATCH SYSTEM

11/30/83

FILE PASTE1 (CREATION DATE = 11/30/83)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE	BOB	SILLING DATE BEGINNING DATE	CAST GUARD CISTRIC				
BROKEN DOWN BY	DIS						
VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			243757.0000	198.3377	107.0464	11458.9290	1229
1	1	1	8714.0000	155.4429	56.0172	2501.7247	58
2	2	2	25420.0000	175.2156	47.1884	1995.8497	109
3	3	3	47375.0000	187.4800	47.1884	1995.8497	109
4	4	4	47375.0000	187.4800	47.1884	1995.8497	109
5	5	5	21175.0000	175.2156	47.1884	1995.8497	109
6	6	6	21175.0000	175.2156	47.1884	1995.8497	109
7	7	7	21175.0000	175.2156	47.1884	1995.8497	109
8	8	8	21175.0000	175.2156	47.1884	1995.8497	109
9	9	9	21175.0000	175.2156	47.1884	1995.8497	109
10	10	10	21175.0000	175.2156	47.1884	1995.8497	109
11	11	11	21175.0000	175.2156	47.1884	1995.8497	109
12	12	12	21175.0000	175.2156	47.1884	1995.8497	109
13	13	13	21175.0000	175.2156	47.1884	1995.8497	109
14	14	14	21175.0000	175.2156	47.1884	1995.8497	109
15	15	15	21175.0000	175.2156	47.1884	1995.8497	109
16	16	16	21175.0000	175.2156	47.1884	1995.8497	109
17	17	17	21175.0000	175.2156	47.1884	1995.8497	109
18	18	18	21175.0000	175.2156	47.1884	1995.8497	109
19	19	19	21175.0000	175.2156	47.1884	1995.8497	109
20	20	20	21175.0000	175.2156	47.1884	1995.8497	109
21	21	21	21175.0000	175.2156	47.1884	1995.8497	109
22	22	22	21175.0000	175.2156	47.1884	1995.8497	109
23	23	23	21175.0000	175.2156	47.1884	1995.8497	109
24	24	24	21175.0000	175.2156	47.1884	1995.8497	109
25	25	25	21175.0000	175.2156	47.1884	1995.8497	109
26	26	26	21175.0000	175.2156	47.1884	1995.8497	109
27	27	27	21175.0000	175.2156	47.1884	1995.8497	109
28	28	28	21175.0000	175.2156	47.1884	1995.8497	109
29	29	29	21175.0000	175.2156	47.1884	1995.8497	109
30	30	30	21175.0000	175.2156	47.1884	1995.8497	109
31	31	31	21175.0000	175.2156	47.1884	1995.8497	109
32	32	32	21175.0000	175.2156	47.1884	1995.8497	109
33	33	33	21175.0000	175.2156	47.1884	1995.8497	109
34	34	34	21175.0000	175.2156	47.1884	1995.8497	109
35	35	35	21175.0000	175.2156	47.1884	1995.8497	109
36	36	36	21175.0000	175.2156	47.1884	1995.8497	109
37	37	37	21175.0000	175.2156	47.1884	1995.8497	109
38	38	38	21175.0000	175.2156	47.1884	1995.8497	109
39	39	39	21175.0000	175.2156	47.1884	1995.8497	109
40	40	40	21175.0000	175.2156	47.1884	1995.8497	109
41	41	41	21175.0000	175.2156	47.1884	1995.8497	109
42	42	42	21175.0000	175.2156	47.1884	1995.8497	109
43	43	43	21175.0000	175.2156	47.1884	1995.8497	109
44	44	44	21175.0000	175.2156	47.1884	1995.8497	109
45	45	45	21175.0000	175.2156	47.1884	1995.8497	109
46	46	46	21175.0000	175.2156	47.1884	1995.8497	109
47	47	47	21175.0000	175.2156	47.1884	1995.8497	109
48	48	48	21175.0000	175.2156	47.1884	1995.8497	109
49	49	49	21175.0000	175.2156	47.1884	1995.8497	109
50	50	50	21175.0000	175.2156	47.1884	1995.8497	109
51	51	51	21175.0000	175.2156	47.1884	1995.8497	109
52	52	52	21175.0000	175.2156	47.1884	1995.8497	109
53	53	53	21175.0000	175.2156	47.1884	1995.8497	109
54	54	54	21175.0000	175.2156	47.1884	1995.8497	109
55	55	55	21175.0000	175.2156	47.1884	1995.8497	109
56	56	56	21175.0000	175.2156	47.1884	1995.8497	109
57	57	57	21175.0000	175.2156	47.1884	1995.8497	109
58	58	58	21175.0000	175.2156	47.1884	1995.8497	109
59	59	59	21175.0000	175.2156	47.1884	1995.8497	109
60	60	60	21175.0000	175.2156	47.1884	1995.8497	109
61	61	61	21175.0000	175.2156	47.1884	1995.8497	109
62	62	62	21175.0000	175.2156	47.1884	1995.8497	109
63	63	63	21175.0000	175.2156	47.1884	1995.8497	109
64	64	64	21175.0000	175.2156	47.1884	1995.8497	109
65	65	65	21175.0000	175.2156	47.1884	1995.8497	109
66	66	66	21175.0000	175.2156	47.1884	1995.8497	109
67	67	67	21175.0000	175.2156	47.1884	1995.8497	109
68	68	68	21175.0000	175.2156	47.1884	1995.8497	109
69	69	69	21175.0000	175.2156	47.1884	1995.8497	109
70	70	70	21175.0000	175.2156	47.1884	1995.8497	109
71	71	71	21175.0000	175.2156	47.1884	1995.8497	109
72	72	72	21175.0000	175.2156	47.1884	1995.8497	109
73	73	73	21175.0000	175.2156	47.1884	1995.8497	109
74	74	74	21175.0000	175.2156	47.1884	1995.8497	109
75	75	75	21175.0000	175.2156	47.1884	1995.8497	109
76	76	76	21175.0000	175.2156	47.1884	1995.8497	109
77	77	77	21175.0000	175.2156	47.1884	1995.8497	109
78	78	78	21175.0000	175.2156	47.1884	1995.8497	109
79	79	79	21175.0000	175.2156	47.1884	1995.8497	109
80	80	80	21175.0000	175.2156	47.1884	1995.8497	109
81	81	81	21175.0000	175.2156	47.1884	1995.8497	109
82	82	82	21175.0000	175.2156	47.1884	1995.8497	109
83	83	83	21175.0000	175.2156	47.1884	1995.8497	109
84	84	84	21175.0000	175.2156	47.1884	1995.8497	109
85	85	85	21175.0000	175.2156	47.1884	1995.8497	109
86	86	86	21175.0000	175.2156	47.1884	1995.8497	109
87	87	87	21175.0000	175.2156	47.1884	1995.8497	109
88	88	88	21175.0000	175.2156	47.1884	1995.8497	109
89	89	89	21175.0000	175.2156	47.1884	1995.8497	109
90	90	90	21175.0000	175.2156	47.1884	1995.8497	109
91	91	91	21175.0000	175.2156	47.1884	1995.8497	109
92	92	92	21175.0000	175.2156	47.1884	1995.8497	109
93	93	93	21175.0000	175.2156	47.1884	1995.8497	109
94	94	94	21175.0000	175.2156	47.1884	1995.8497	109
95	95	95	21175.0000	175.2156	47.1884	1995.8497	109
96	96	96	21175.0000	175.2156	47.1884	1995.8497	109
97	97	97	21175.0000	175.2156	47.1884	1995.8497	109
98	98	98	21175.0000	175.2156	47.1884	1995.8497	109
99	99	99	21175.0000	175.2156	47.1884	1995.8497	109
100	100	100	21175.0000	175.2156	47.1884	1995.8497	109

TOTAL CASES = 1229

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CREATION DATE = 11/30/83)

CRITERION VARIABLE		DESCRIPTION OF SUBPOPULATIONS					
BROKEN DOWN BY	BY	BILLING DATE	COMPLETION DATE				
	YR	FISCAL YEAR OF INSPECTION					
VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE PCPOPULATION			214298.0000	174.3352	102.1214	10428.7849	1229
YR	81.		73528.0000	181.8349	55.7367	3168.2214	417
YR	82.		82119.0000	174.3352	110.0462	12218.7849	478
YR	83.		58651.0000	140.1332	87.6418	7681.0788	334
TOTAL CASES =			1229				

SPSS BATCH SYSTEM

11/30/83

FILE MASTER1 (CREATION DATE = 11/30/83)

----- DESCRIPTION OF SUBPOPULATIONS -----

CRITERION VARIABLE 8000

SILVER DATE COMPLETION DATE

BROKEN CORR BY

CLASS GUARD DISTALC

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIA	N
FOR ENTIRE POPULATION			214258.0000	174.3352	102.1214	10424.7	229
1	1	7761.0000	138.8893	47.4730	2272.7	140	
2	2	1821.0000	10.0000	1.0000	1.0000	10	
3	3	2142.0000	1.0000	1.0000	1.0000	1	
4	4	2142.0000	1.0000	1.0000	1.0000	1	
5	5	2142.0000	1.0000	1.0000	1.0000	1	
6	6	2142.0000	1.0000	1.0000	1.0000	1	
7	7	2142.0000	1.0000	1.0000	1.0000	1	
8	8	2142.0000	1.0000	1.0000	1.0000	1	
9	9	2142.0000	1.0000	1.0000	1.0000	1	
10	10	2142.0000	1.0000	1.0000	1.0000	1	
11	11	2142.0000	1.0000	1.0000	1.0000	1	
12	12	2142.0000	1.0000	1.0000	1.0000	1	
13	13	2142.0000	1.0000	1.0000	1.0000	1	
14	14	2142.0000	1.0000	1.0000	1.0000	1	
15	15	2142.0000	1.0000	1.0000	1.0000	1	
16	16	2142.0000	1.0000	1.0000	1.0000	1	
17	17	2142.0000	1.0000	1.0000	1.0000	1	
18	18	2142.0000	1.0000	1.0000	1.0000	1	
19	19	2142.0000	1.0000	1.0000	1.0000	1	
20	20	2142.0000	1.0000	1.0000	1.0000	1	
21	21	2142.0000	1.0000	1.0000	1.0000	1	
22	22	2142.0000	1.0000	1.0000	1.0000	1	
23	23	2142.0000	1.0000	1.0000	1.0000	1	
24	24	2142.0000	1.0000	1.0000	1.0000	1	
25	25	2142.0000	1.0000	1.0000	1.0000	1	
26	26	2142.0000	1.0000	1.0000	1.0000	1	
27	27	2142.0000	1.0000	1.0000	1.0000	1	
28	28	2142.0000	1.0000	1.0000	1.0000	1	
29	29	2142.0000	1.0000	1.0000	1.0000	1	
30	30	2142.0000	1.0000	1.0000	1.0000	1	
31	31	2142.0000	1.0000	1.0000	1.0000	1	
32	32	2142.0000	1.0000	1.0000	1.0000	1	
33	33	2142.0000	1.0000	1.0000	1.0000	1	
34	34	2142.0000	1.0000	1.0000	1.0000	1	
35	35	2142.0000	1.0000	1.0000	1.0000	1	
36	36	2142.0000	1.0000	1.0000	1.0000	1	
37	37	2142.0000	1.0000	1.0000	1.0000	1	

TOTAL CASES = 1229

APPENDIX D: DATA VALIDATION COMPUTER PROGRAM

FILE: VALPRCG WATFIV APPENDIX D

```

$JOB
*****
* LT ASHLEY LT THOMPSON *
* THESIS PROJECT *
* DATA VALIDATION PROGRAM *
* 23 SEPT. 1983 *
*****

**** PURPOSE ****
THE PURPOSE OF THIS PROGRAM IS TO AID IN VALIDATION OF THE DATA
CONTAINED IN THE OVERSEAS MARINE INSPECTION BILLING DATA FILE.
THIS PROGRAM USES THE VARIABLE DEFINITIONS USED IN THAT FILE.
EACH LINE OF DATA IS READ IN, CHECKED SEPARATELY AND PRINTED IF
AN ERROR IS FOUND WITHIN THE LINE.

**** VARIABLE DECLARATIONS ****
INTEGER DIST, YR, QTR, MONTH, RANK, DUMA, BDBC, BCCD, CUMB
REAL AMTB, MHAW, MHLT, MHTOT, MHTEST, TESTA, TESTB, TESTC, TESTD,
REAL TESTE, TESTF, TESTG, TESTH, TESTI, TESTJ, TESTK, TESTL, TESTM, TESTN

WRITE (6,500)
PRINT, 'THE FOLLOWING DATA LINES ARE IN ERROR:'
PRINT, ' '
READ IN THE INPUT DATA PER LINE
READ (5,1000) DIST,YR,QTR,MONTH,RANK,AMTB,DUMA,BDBC,BCCD,MHAW,
1 MHLT,MHTOT,DUMB

IF (DIST.EQ.99) GC TO 200
THE FOLLOWING IFS VERIFY THAT MHAW AND MHLT SUM TO MHTOT.
THE TEST VARIABLES ARE USED TO CORRECT FOR ROUNDING ERROR WITHIN
THE COMPUTER.
MHTEST = MHAW + MHLT
TESTA = MHTEST + .001
TESTB = MHTEST + .002
TESTC = MHTEST + .0001
TESTD = MHTEST + .0002
TESTE = MHTEST + .0003
TESTF = MHTEST + .0004
TESTG = MHTEST + .0005
TESTH = MHTEST + .0006
TESTI = MHTEST - .001
TESTJ = MHTEST - .0001
TESTK = MHTEST - .00001
TESTL = MHTEST - .000001
TESTM = MHTEST - .0000001
TESTN = MHTEST - .00000001

IF (MHTEST.EQ. MHTOT) GO TC 10
IF (TESTA.NE.0) GO TC 10
IF (TESTB.NE.0) GO TC 10
IF (TESTC.NE.0) GO TC 10
IF (TESTD.NE.0) GO TC 10
IF (TESTE.NE.0) GO TC 10
IF (TESTF.NE.0) GO TC 10
IF (TESTG.NE.0) GO TC 10
IF (TESTH.NE.0) GO TC 10
IF (TESTI.NE.0) GO TC 10
IF (TESTJ.NE.0) GO TC 10
IF (TESTK.NE.0) GO TC 10
IF (TESTL.NE.0) GO TC 10
IF (TESTM.NE.0) GO TC 10
IF (TESTN.NE.0) GO TC 10
GO TO 100

THE FOLLOWING IFS VERIFY THAT THE DUMMY VARIABLES ARE ASSIGNED
PROPER VALUES.
IF ((DUMA.NE.0).AND.(DUMA.NE.1)) GC TC 100

```

FILE: VALPRCG NATFIV

```

I      ((CLMB.NE.O).AND.(CLMB.NE.2)) GC TC 100
TTTT  ((ATB.FE.O).AND.(CLMB.NE.O)) GC TC 100
      ((DLMA.FE.O).AND.(ATB.NE.O)) GC TC 100
TTTT  ((TOT.O).AND.(OUCHE.NE.O)) GC TC 100
      ((CLMB.EG.O).AND.(TOT.NE.O)) GC TC 100

```

THE FOLLOWING IFs VERIFY THAT THE VARIABLE 'RANK' IS WITHIN THE PROPER RANGE OF VALUES.

```

IF (RANK.GT.24) GC TO 100
IF (RANK.LT.0) GO TC 100
((RANK.EQ.7).OR.(RANK.EC.8)) GO TO 100
((RANK.EQ.9).OR.(RANK.EC.10)) GO TO 100
((RANK.EQ.14).OR.(RANK.EC.15)) GO TC 100
(RANK.EC.16) GC TO 100
((RANK.EQ.20).OR.(RANK.EC.21)) GO TC 100

```

THE FOLLOWING IFS VERIFY THAT THE VARIABLE 'DIST' IS WITHIN THE PROPER RANGE OF VALUES.

```
IF (DIST.LT.0) GO TO 100
IF (DIST.GT.37) GO TO 100
IF ((DIST.EQ.4).OR.(DIST.EC.6)) GO TO 100
IF ((DIST.EQ.10).OR.(DIST.EC.15)) GO TO 100
IF (DIST.EQ.16) GO TO 100
IF ((DIST.GE.18).AND.(DIST.LE.29)) GO TO 100
```

THE FOLLOWING IF VERIFIES THAT 'BDCD' IS LESS THAN OR EQUALS BCBD.

```
IF (BCCD.GT.8080) GC TC 10C
```

THE FOLLOWING IFS VERIFY THE CONSISTENCY OF THE VARIABLES 'MONTH'
AND 'CTR' WITH EACH OTHER AND THEIR PROPER RANGE OF VALUES.

[illegible]

THE FOLLOWING IFS VERIFY THE CONSISTENCY OF THE VARIABLES 'QTR'
AND 'YR' WITH EACH OTHER AND THEIR PROPER RANGE OF VALUES.

[illegible]

LIST OF REFERENCES

Anthony, Robert W. and Herzlinger, Regina E., Management Control in Nonprofit Organizations, Homewood, Illinois: Richard D. Irwin, Inc., 1980.

Ashford, Nicholas A., "The Limits of Cost-Benefit Analysis in Regulatory Decisions," Technology Review, May, 1980. pp. 70-72.

Commandant (G-MP), United States Coast Guard, "Annual Report to Congress: Delegations to the American Bureau of Shipping," June, 1982.

Comptroller General, General Accounting Office, How Effective is the Coast Guard in Carrying Out Its Commercial Vessel Safety Responsibilities? Washington, D.C.: Government Printing Office, 1979.

Cornell, Alexander H., The Decision-Maker's Handbook, Englewood Cliffs, New Jersey; Prentice-Hall, Inc., 1980.

Corti, G., "Risk, Uncertainty and Cost Benefit: Some Notes on Practical Difficulties for Project Appraisals," in Wolfe, J.N. (ed.) Cost Benefit and Cost Effectiveness, London, United Kingdom: George Allen & Unwin, Ltd., 1973.

Department of Defense, Defense Economic Analysis Council, Economic Analysis Handbook, 2nd edition, n.d.

Department of Transportation, Office of the Secretary of Transportation, United States Coast Guard and Office of Management and Budget, Coast Guard Roles and Missions, Washington, D.C.: Government Printing Office, 1982.

Department of Transportation, United States Coast Guard, Commandant Notice 7100, "Standard Personnel Costs," 1981-1983.

Department of Transportation, United States Coast Guard, "Closure of Overseas Marine Inspection Offices," Federal Register, Vol. 47, No. 55, March 22, 1982.

Department of Transportation, United States
Coast Guard, Commercial Vessel Safety Operating
Program Plan FY 85-94, January, 1982.

Dubin, Robert, "Organizational Effectiveness: Some
Dilemmas of Perspective," in Spray, S. Lee (ed.)
Organizational Effectiveness: Theory-Research-
Utilization, Kent, Ohio: Kent State University
Press, 1976.

Gramlich, Edward M., Benefit-Cost Analysis of
Government Programs, Englewood Cliffs, New
Jersey: Prentice-Hall, Inc., 1981.

Hatry, Harry P., "The Use of Cost Estimates," in
Goldman, Thomas A. (ed.) Cost Effectiveness
Analysis: New Approaches in Decision-Making,
New York, New York: Frederick A. Praeger, Inc., 1967.

Hatry, Harry P., Winnie, Richard E., and
Fick, Donald M., Practical Program Evaluation
for State and Local Governments, Washington, D.C.:
The Urban Institute, 1978.

Kohler, Heinz, Intermediate Microeconomics: Theory
and Applications, Glenview, Illinois:
Scott, Foresman and Company, 1982.

Maritime Transportation Research Board, Commission
on Sociotechnical Systems, Critical Issues in
Maritime Transportation, Washington, D.C.:
National Academy Press, 1981.

McCullough, James D., "Estimating Systems Costs,"
in Goldman, Thomas A. (ed.) Cost Effectiveness
Analysis: New Approaches in Decision-Making,
New York, New York: Frederick A. Praeger, Inc., 1967.

Niskanen, William A. "Measures of Effectiveness,"
in Goldman, Thomas A. (ed.) Cost Effectiveness
Analysis: New Approaches in Decision-Making,
New York New York: Frederick A. Praeger, Inc., 1967.

Quade, D., "Introduction and Overview," in
Goldman, Thomas A. (ed.) Cost Effectiveness
Analysis: New Approaches in Decision-Making,
New York, New York: Frederick A. Praeger, Inc., 1967.

_____, Analysis for Public Decisions, New York,
New York: American Elsevier Publishing Co., Inc., 1975.

Sassone, Peter G. and Schaffer, William A., Cost-Benefit Analysis: A Handbook, New York, New York: Academic Press, Inc., 1978.

Smith, W.J., "Letter of Promulgation," in United States Coast Guard, A Study of Cost Benefits Effectiveness of the Merchant Marine Safety Program, Washington, D.C.: Government Printing Office, 1968.

Sorensen, James E. and Grove, Hugh D., "Cost-Outcome and Cost-Effectiveness Analysis: Emerging Nonprofit Performance Evaluation Techniques," The Accounting Review, Vol. LII, No. 3 (1977), pp. 658-675.

Steiner, George A., Top Management Planning, London, United Kingdom: Macmillan Co., 1969.

United States Coast Guard, A Study of Cost Benefits Effectiveness of the Merchant Marine Safety Program, Washington, D.C.: Government Printing Office, 1968.

U.S. Congress. Subcommittee on Coast Guard and Navigation of the Committee on Merchant Marine and Fisheries. Report No. 97-355, Semi-Paratus: The United States Coast Guard, 1981, 97th Congress, 1st session, 1981. Washington, D.C.: Government Printing Office, 1981.

Williams, Alan, "Cost-benefit Analysis: Bastard Science? And/Or Insidious Poison in the Body Politick?" in Wolfe, J.N. (ed.) Cost Benefit and Cost Effectiveness, London, United Kingdom: George Allen & Unwin, Ltd., 1973.

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84